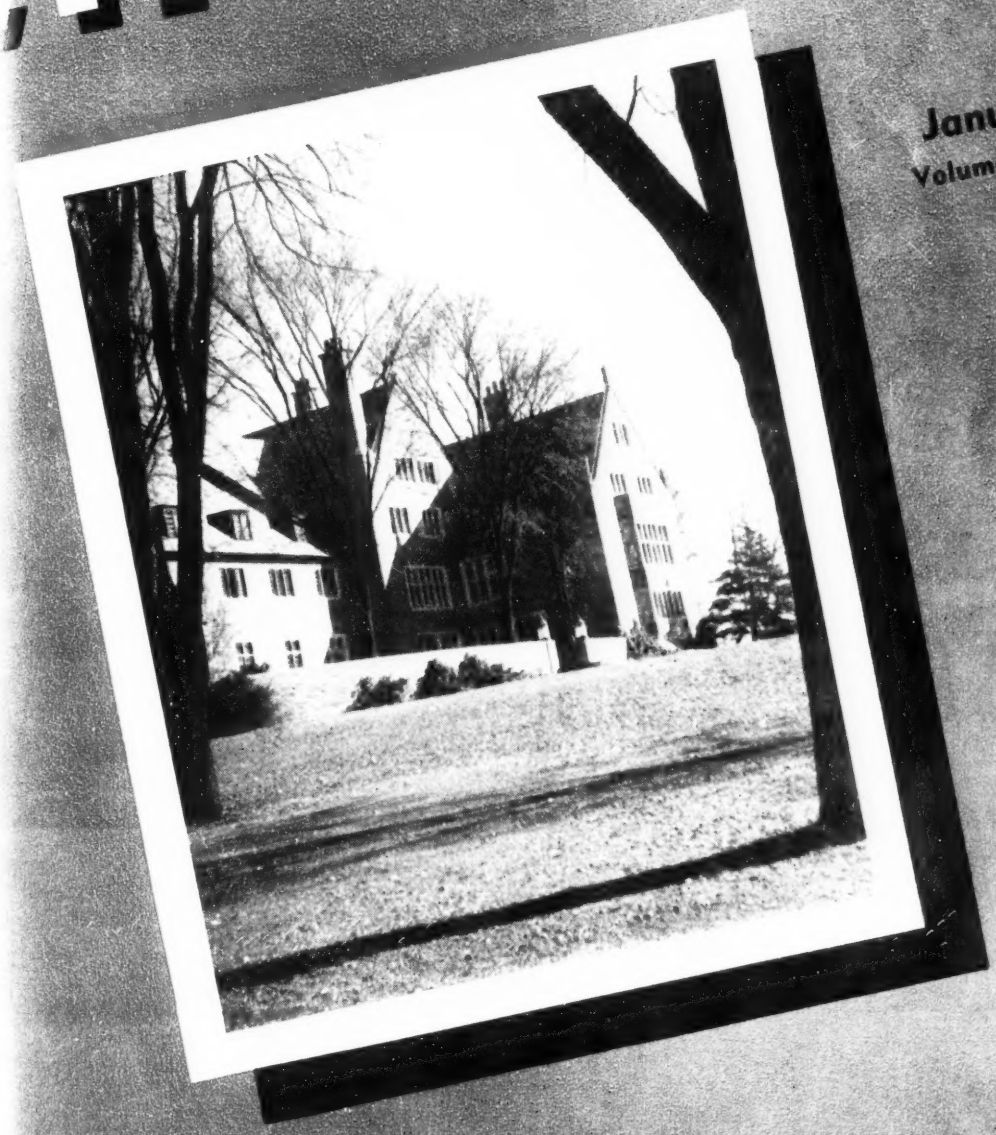
THE CORNELL ENGINEER

January, 1944
Volume 9—Number 4



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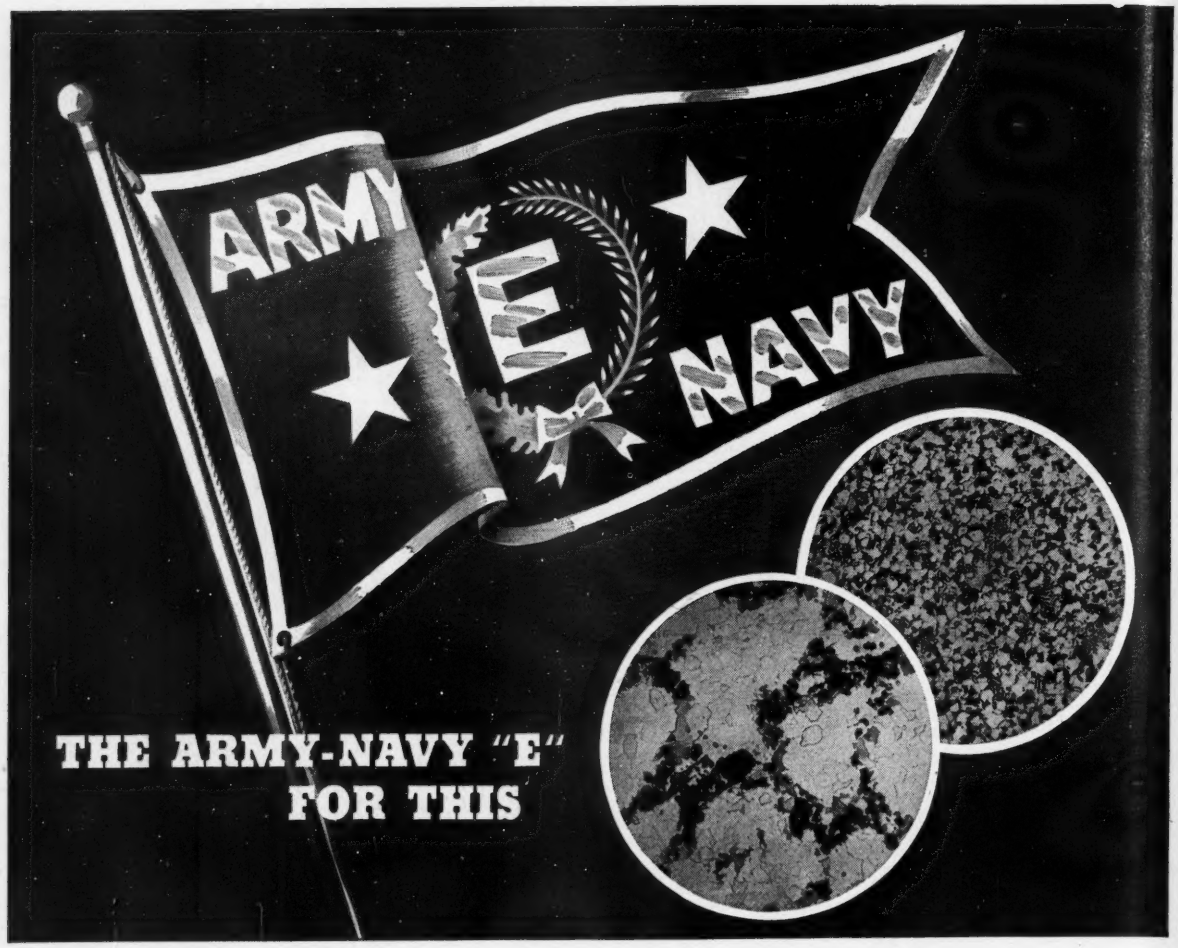

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The CORNELL ENGINEER

Volume 9 JANUARY, 1944 Number 4

Contents

Cover:
Balch Hall

Frontis:
This steam-powered "windmill," shown receiving finishing touches before assembly at the Steam Division of the Westinghouse Electric and Manufacturing Company, drives a 260-ton generator.

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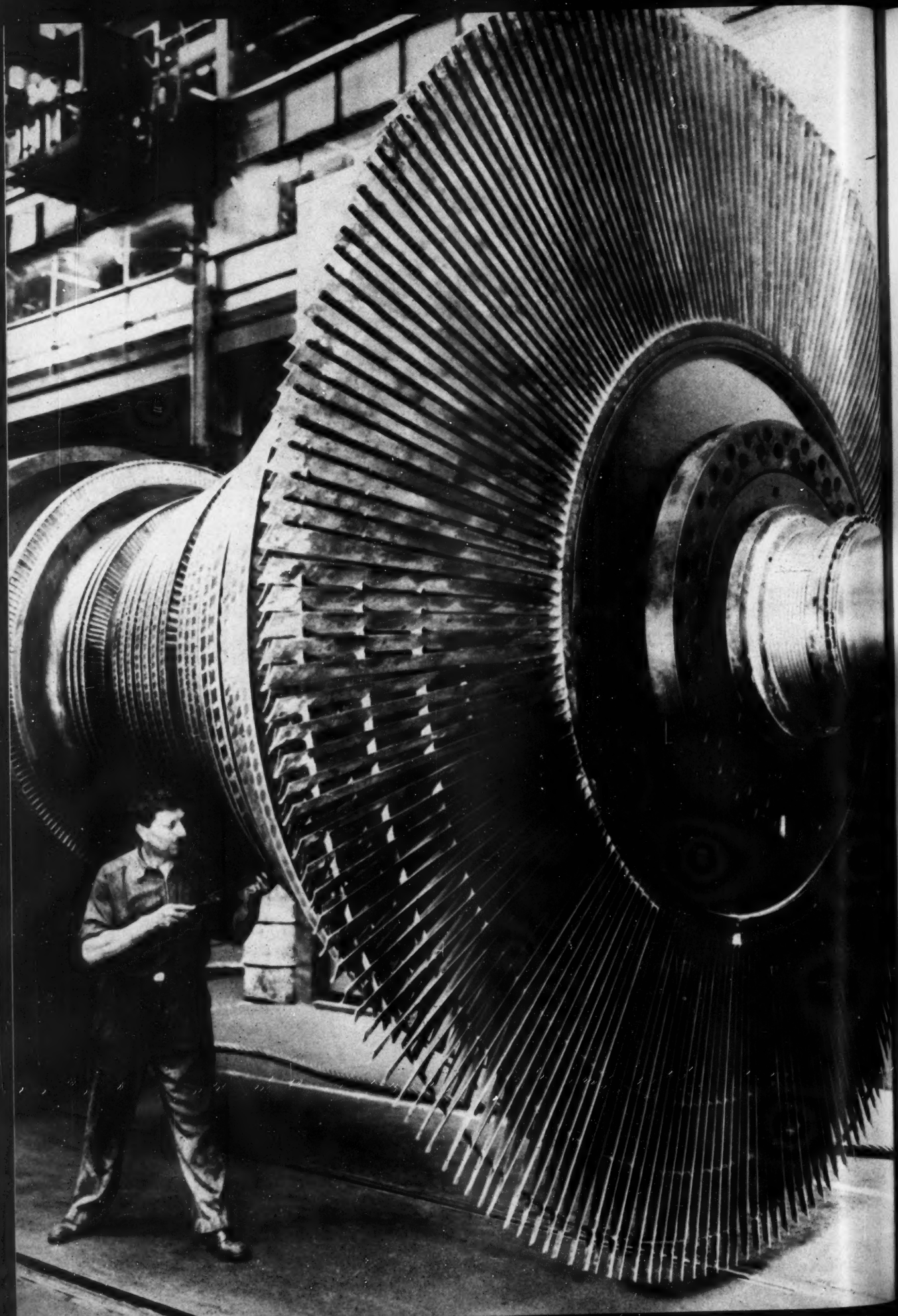

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A Telephone Cable That Can Keep a Secret

By C. D. HART, M.E. '06

Superintendent of Wire Products Shops, Western Electric Company

IN MODERN warfare adequate and reliable communication between all branches of the fighting forces—land, sea, air, and undersea—is of great importance for proper coordination of action.

For many of these services, where radio is the only practical method, the Walkie-Talkie or Aerial Command Sets are used; but where possible, wire circuits are desired because of their secrecy, simplicity, and reliability. These wire circuits may take many different forms. One very fine stranded conductor, insulated with an extremely thin wall, is so light that the Signal Corps man can carry one-half mile of it on his arm, uncoiling it as the troops advance. Also there is the so-called field wire, which is a somewhat heavier conductor whose insulation is protected by a weather-proofed braid. Tossed from a truck travelling at high speed, it lies along the highway and furnishes a quite satisfactory temporary connection for moderate distances.

For more satisfactory semi-permanent communications lines between the different parts of an army, however, it is desirable to have circuits which can be put into service quickly, and which can be used overhead, on the ground, or underground as the occasion requires. Therefore, the cable used must be flexible, water-resistant, strong enough to withstand considerable strain, and easy to handle. At the same time, the cable must maintain its integrity for extended periods and give adequate transmission for distances up to some hundreds of miles.

Flexible But Rugged

One of the principle types of communications lines developed for this purpose is known as Spiral-4 cable. It consists of four stranded conductors, each insulated individually with rubber or one of the synthetics, then spiralled around a non-moisture absorbing and non-metallic center, wrapped with a metal backed paper as a shield, given a braid of steel wire and finally encased in a moisture-proof jacket (Figure 1). The terminals which connect the lengths are water-tight when locked together. Because there are only four conductors, and these made of copper, the steel wire braid which permits a high degree of flexibility is applied over the metallic shield and under the jacket to give the cable the necessary tensile strength.

Although this cable does not appear to be particularly complicated, precision must be used in every phase of its manufacture in order to meet the rigid electrical and mechanical test requirements established by the Army Signal Corps. The copper, steel, paper and rubber which go into the cable are subjected to individual tests and then are tested again in the completed cable.

The cable is so designed that its electrical characteristics permit the use of a high frequency carrier for multiple transmission. Thus from the two pairs of conductors, or two complete circuits, four telephone circuits or three telephone and four telegraph circuits are made available.

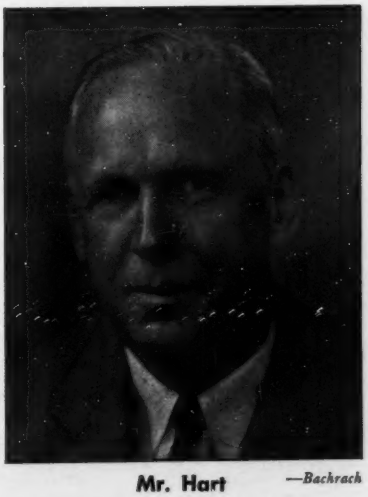
Wire Tapping Prevented

Secrecy of transmission is greatly increased, moreover, by the use of the carrier frequency. Unless he were equipped with a highly complex electronic device of special design, an enemy tapping the Spiral-4 ahead of the terminal point would get nothing for his trouble

THE AUTHOR

At Cornell Mr. Hart specialized in electrical engineering, but received on M.E. degree because the University gave no electrical engineering degree at that time. After graduation he held a succession of positions with the Western Electric Company, culminating in his present post as Superintendent of Wire Products Shops at the Point Breeze plant in Maryland.

Mr. Hart was elected to Tau Beta Pi by the Cornell Chapter in 1938. Later he collaborated with Professor John R. Bangs in writing the book "Factory Management."



Mr. Hart —*Bachrach*

but an unintelligible mixture of squeaks and squeals.

With carrier and appropriate amplifiers, this type of cable is good for transmission to 400 or 500 miles if laid underground, and up to 150 miles on the ground.

In citing some details of the manufacture of Spiral-4 cable, necessity for accuracy at each stage of production may be shown, and the mechanical or electrical reason for the method of construction indicated. Thus the conductors must be uniform for good performance both mechanically and electrically. They are made up of a number of individual strands instead of each being one solid conductor, as they have greater flexibility thereby and are less liable to rupture. The individual strands are given a tin or lead tin coating to protect them against any chemical action by the insulating material. The diameter of each is held within very close limits so that there will be no electrical unbalance between the wires in the completed cable.

Capacitance is the term used to describe the electrical relationship between the conductors and the ground or metallic shield around them, and between the conductors themselves. A high capacitance unbalance exists when there is a lack of symmetry due to differences in the insulated conductors themselves, or in their arrangement. This may exist between conductors or from conductors to ground. To avoid such conditions, special care must be taken in the insulating operation to maintain the concentricity and uniformity of wall thickness of the insulating material throughout.

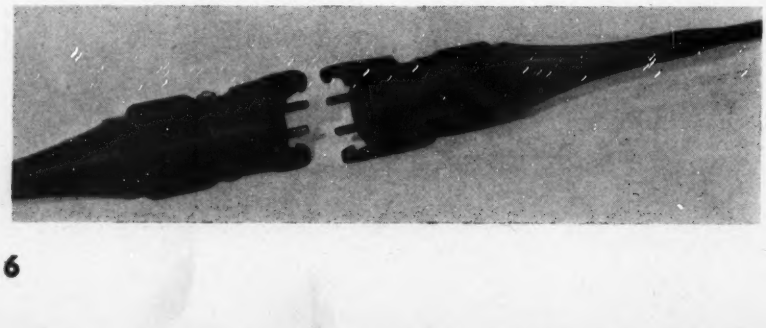
By old wire manufacturing methods in use some years ago, before the introduction of modern accelerators (and still used in some cases), rubber insulation was extruded around wire, and the wire then coiled into pans containing a bedding of soapstone to prevent injury to the soft insulation. These pans were then put into a retort and cured under heat and pressure for about an hour. The wire was then uncoiled from the soapstone onto spools. This method was dusty, unpleasant and slow. By the use of modern accelerators added to the compound, it is possible to extrude the insulated conductor directly into a steam-filled tube, and by proper coordination between the speed of extrusion and the length of the tube, to complete vulcanization so that the finished wire is taken up directly on a spool. The time of curing depends somewhat upon the compound used and the wall thickness of the insulation, but the vulcanizing time with the use of these accelerators is a small fraction of a minute, instead of approximately an hour. Thus an ordinary wire might be insulated and vulcanized in a 100 foot tube at a rate of 400 feet per minute.

—Courtesy Mettee

Figure 1. An expanded section of Spiral-4 cable.

Figure 2. Two cable terminals in position to be locked together.

—Courtesy Mettee



Plastic Center Used

The individual insulated conductors, two white and two black, are spiralled around a center of plastic thread so that the two conductors of a pair are diametrically opposite each other. Four conductors thus twisted are called a spiral four quad.

A metal backed paper is next applied. It acts as an electrical shield or ground, and also as a bedding for an open braid of high tensile strength steel wires. As the finished cable must withstand a high voltage breakdown test, particular care must be taken in all manufacturing operations to avoid any injury to the conductors. The braiding operation requires close attention so that the braid is not put on so loosely as to cause buckling at the jacketing operation, or so tightly as to cut too deeply into the insulation on the conductors when a pull is exerted on the cable (Figure 3). Broken ends also must be repaired carefully so that they do not penetrate inward to the conductor to cause a voltage breakdown failure, or outward to pierce the jacket.

The braided length is run through the continuous vulcanizing machine and given a jacket which forms not only a moisture-proof covering, but a tough mechanical protection as well. Here again uniformity is important so that the protection will be adequate. The jacketed cable is made in lengths of approximately one-quarter mile. A special terminal is connected to each end.

Terminals Contain Loading Coils

These terminals contain four connectors, two male and two female. In each end is incorporated a loading coil for the purpose of improving transmission, one being connected to the white pair and the other to the black pair. After the

(Continued on page 29)

Food Freezing

By MIRCEA R. SFAT, B. Chem.E. '43

Research Assistant, Cornell University

A PREHISTORIC hunter is returning to his lair with his day's kill slung over his shoulder. As he is crossing a small slow-moving stream a marauding sabre-tooth tiger challenges him. In his haste to reach safety the hunter accidentally drops his kill into a pond, thus placing the meat out of the reach of the tiger. That night the temperature suddenly drops and the pond freezes over. Still fearing the stalking tiger, the hunter does not leave his lair for several days; in this time the pond and meat are completely frozen and the hunter forgets his loss. That winter food becomes scarce and after a few months the hunter and his family become destitute. Hunger forces his mind to recall the animal which he had dropped into the stream. Although he is sure that he will become sick if he eats flesh that has been dead for two months, he must see if he can find the meat; hunger is more powerful than fear of sickness or death in the mind of this primitive man. His quest is successful and with some misgiving he and his family ravenously attack the frozen food. To their mutual surprise, they find the meat as succulent as any fresh meat they have tasted!

Early Experiments

Perhaps it was in some such manner as this that humans first made use of freezing to preserve food. Although we do not have any evidence of the first successful attempt to freeze food, we are positive that this method was employed long before the freezing of food was first scientifically investigated by Lord Francis Bacon. It is related that Lord Bacon stepped from his carriage to stuff a fowl with snow in order to observe the effect of such treatment. The experiment cost the scientist his life, for the exposure resulted in a fatal case of pneumonia.

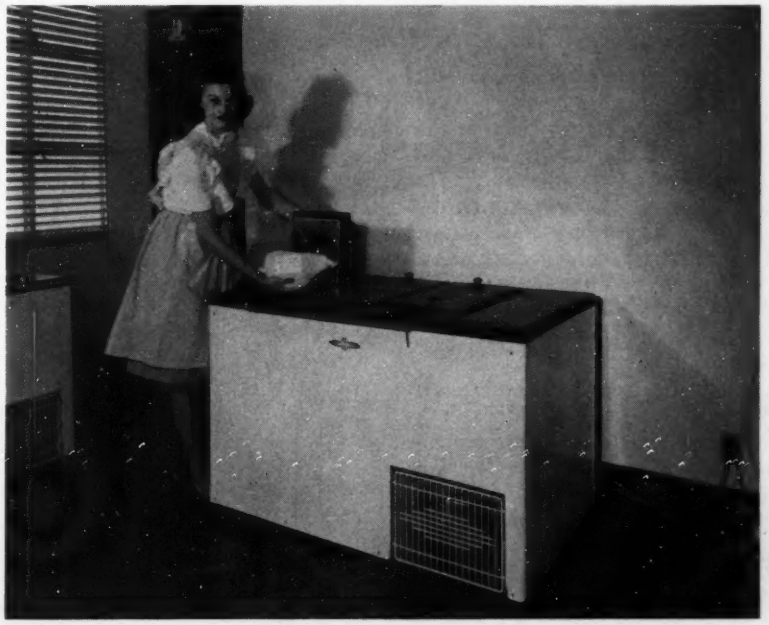
About 100 years ago, H. Benjamin was granted the first patent on a method of freezing. In 1869, about 10 years before the development of mechanical refrigeration, D. W. Davis of Detroit was awarded a patent on the freezing of fish by immersion of the fish in a eutectic mixture of ice and salt. This method is still used today. Since these early beginnings, the freezing preservation of food has progressed tremendously, the development of mechanical refrigeration being especially important.

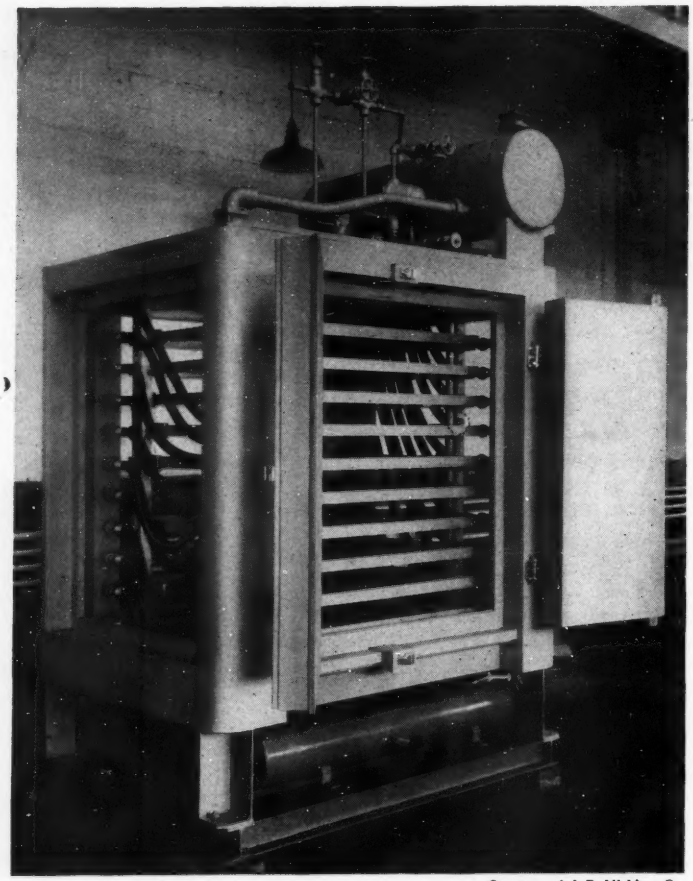
One might ask, why is freezing used as a means of preservation? Aren't ordinary refrigeration and canning methods sufficient? The answer is that freezing prevents the deterioration of foods through enzyme and bacteria activity more effectively than any other means, and frozen food may be preserved longer and without change in appearance, palatability, and vitamin content. Further, it is not necessary to harvest fruits and vegetables prematurely for preservation by freezing.

Methods of Freezing

In the early stages of development, the rate of freezing was not considered an important factor. However, in the last two decades, considerable thought and experimentation have been expended in order to determine the effect of the rate of freezing on the quality of food. Attempts to define quick-freezing have been made and the most satisfying of these are those

A typical home freezer unit. *—Courtesy General Motors*





—*Courtesy Avi Publishing Co.*

Birdseye 10-station multiplate freezer with sides removed.

of Woodroof and Pennington. Woodroof defines as quick-freezing any process in which the rate of travel of the ice zone is 0.3 centimeter per minute or faster. Pennington states that quick-freezing occurs when it takes 30 minutes or less to freeze the center of food from 32°F. to 25°F. The importance of the rate of freezing is still not settled. The exact effect of the size of the ice particles on the structure of the food and its resultant quality is not known. In the case of meat, for example, the palatability of slow-frozen meat is as high as for quick-frozen meat. Obviously, the final settlement of this problem is necessary in order to design intelligently a freezing system.

Since the term "quick-freezing" is still not adequately defined, it is difficult to differentiate between so-called slow- and quick-freezing systems. The division employed here is the same employed by Tressler and Evers in their book, *The Freezing Preservation of Foods.* If Woodroof's definition were employed, then none of the methods in use today is truly quick-freezing.

Freezing in still air is the only slow-freezing method in use today. ("Sharp-freezing" is a term often used to refer to slow-freezing). This method is employed in some old locker plants and in most home-freezing units. A slow rate of freezing results because of the high thermal resistance of the air films around the food and the refrigerated surface.

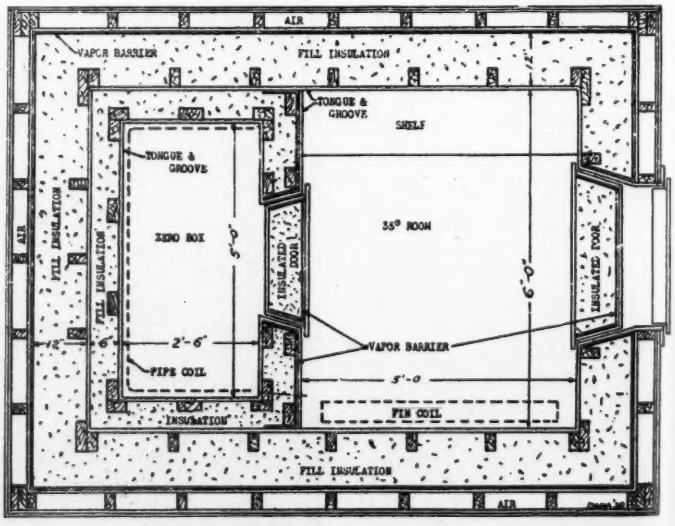
Quick Freezing

Practically all the remaining methods of freezing are classified as quick-freezing. The direct immersion system involves placement of the food in a refrigerated liquid. H. F. Taylor and M. T. Zarotschenzeff devised two systems which are in rather wide use today. In the Taylor method, fish are conveyed through an insulated room where they are sprayed by a low temperature brine. The "Z" process, as Zarotschenzeff's process is commonly called, consists essentially of spraying food with an atomized liquid refrigerant. Due to the direct contact of the refrigerated liquid with the product in direct immersion, the rate of heat transfer is quite high. However, the refrigerated brine or syrup may contaminate the taste or quality of the food. Furthermore, these refrigerated solutions are difficult to handle; brine is rather corrosive and the syrup is viscous. Direct immersion is employed only by commercial food freezers.

Indirect contact with the refrigerant is one of the most extensively employed methods of quick-freezing. It consists essentially of engaging the product with a metal surface which is cooled by a refrigerant. Most farm freezers, home

General layout of a farm freezing plant with a side-door type of "zero box."

—*Courtesy Avi Publishing Co.*



freezers, and locker plants employ a one-side contact. Food is placed on horizontal plates or is packed against vertical plates. This results in a favorable rate of heat transfer due to direct contact with the plates. One of the most publicized freezers, the Birdseye multiplate-freezer, employs plate contact on both sides of the product. The unit consists of a battery of 3 to 11 hydraulically-operated horizontal plates which are movable along a vertical axis. The food is held between the plates under a pressure of approximately 25 pounds per square inch; this contributes to excellent heat transfer characteristics. Another multiple-side contact freezing device was developed by Zarotschenzeff in 1939. The refrigerating surfaces are flexible bags which will adapt themselves to the contour of the object being frozen.

Air blast freezing is often employed in home freezers, locker plants, and by commercial food freezers. Refrigerated air is circulated at a high velocity around the food products in order to reduce the thermal resistance of the air films and to remove heat by convection. Air blast freezing is often employed in conjunction with one-side contact-freezing.

Commercial Food Freezers, Locker Plants, and Home Freezing Units

Smart promotional work and a high quality product has been the keynote of commercial frozen foods for the past two decades. Undoubtedly the most important factors in the expansion of the frozen food industry as a whole have been the publicity programs sponsored by commercial food freezers coupled with consistently high quality products. One important reason for the success of these foods is that only the very finest quality food is selected for freezing.

Locker plants are an outgrowth of the cold storage warehouse. In the first part of this century cold storage warehouse operators began renting floor space to farmers who wanted a place to store their slaughtered animals. In due time crude lockers were built to accommodate the farmers. When frozen food became more popular, enterprising warehousemen built locker plants which possessed facilities for processing the meat for the customer. This development has continued so that today a modern locker plant will butcher, chill, cut, grind, wrap, cure, smoke, freeze, and store meat, and will sort, clean, scald, package, freeze, and store vegetables. In addition, a complete plant will have a complete line of commercially frozen foods and a retail grocery and meat store as well. The growth of this industry is evidenced by the increase in locker plants from 1,269 in 1938 to 4,156 in 1941.

The future holds bright prospects for locker plants. Today, many plants are already designed and are merely waiting for the release of critical materials for construction. Legal regulations which are already in effect in many states insure the public of sound food handling and will aid materially in the favorable development of locker plants. There is still a great deal of room for improvement in the design of the freezing systems and in the convenient arrangement of storage space for locker patrons.

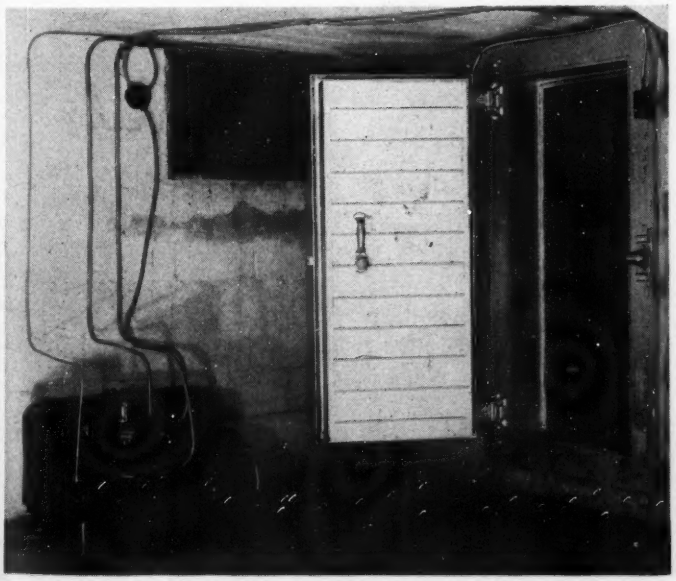
When frozen foods came on the market it became necessary to provide low temperature home storage space. These single-compartment storage units were eventually made larger and provided with a freezing

(Continued on page 30)

—Courtesy General Motors

A typical locker room with overhead plate evaporators.

Refrigerating unit of a walk-in type farm freezer.
—Courtesy Avi Publishing Co.



Arc Welding in Aviation

By HOWARD J. SAMUELY, ChemE '46

IF ARC welding were used fully in aviation, in those applications where the arc has already established its unique superiority, the air transport industry would annually net an approximate ten-million dollar saving. This is the considered judgment of a competent welding engineer, confirmed daily by the immense economies being realized, through arc welding, by aircraft corporations all over the nation. It is commonplace to find arc fabrications cutting costs by twenty-five per cent. The Douglas DC-4 might be built for $350,000, as compared with the present cost of $500,000, if suitably arc welded. The late airship Hindenburg, costing in the neighborhood of four million dollars, might have been built with a saving of close to $800,000 if arc welded. In the manufacture of cannon-carrying Army P-39 Airacobras, Bell Aircraft has found that, with arc welding, scores of procedures are completed in one-half the time otherwise needed with gas welding. Vultee has case-histories where arc welding speeded up production by at least twenty-five per cent. Because the electric arc produces a far slimmer ribbon of heat, realignment time on major operations may be reduced by close to fifty per cent. In the production of stainless steel wings, riveted construction costs almost sixty per cent more than welding, and the mounting of the various small fittings may take anywhere from two to four times as long. If only because of savings of money and time, arc welding finds broad latitudes of usage in many of the most prominent phases of aircraft manufacture.

This article is an abstract of the essay, "Progress Through Arc Welding; Accent on Aircraft," for which the author received a $100 prize in a contest sponsored by the James F. Lincoln Arc Welding Foundation last May. The complete manuscript of 161 pages has been deposited in the Sibley Library.

George W. Bishop, ME '44, also won a $100 prize in this competition.

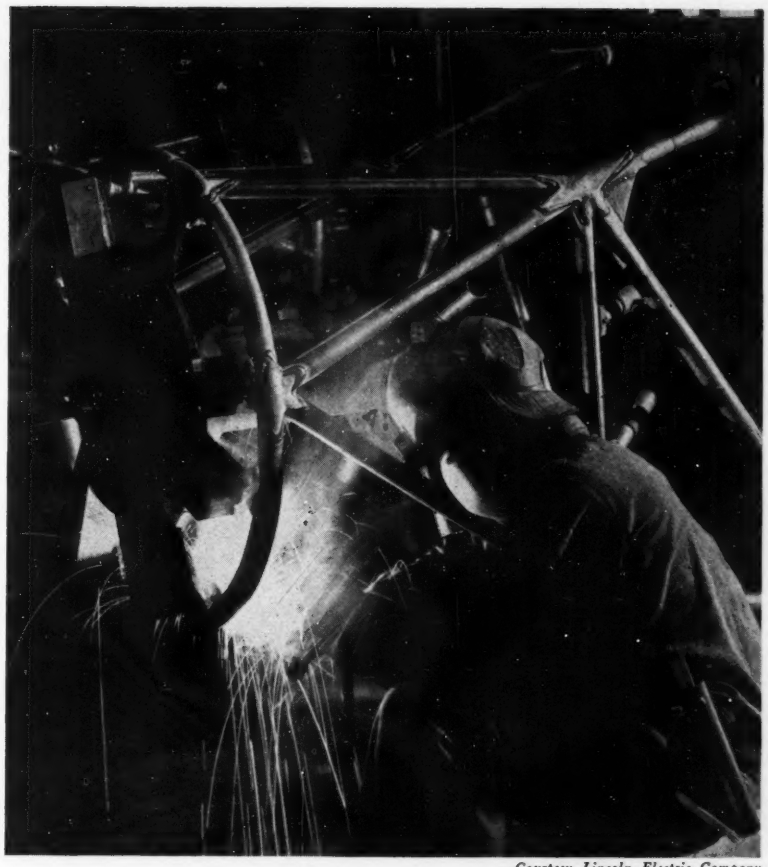
Even so, it is scarcely the purpose here to attach unlimited merit to aircraft arc welding. Actually, in great numbers of operations, the arc welding heat is far too intense to be applied without critical damage to thin metal sections of less than a tenth of an inch thickness, so common in aviation. Arc welding cannot be used either on aluminum or magnesium. Furthermore, whatever advantages may be cited for arc welding over riveting are equally valid, in many cases, for gas and resistance welding. In numerous constructions, resistance welding is considerably more characteristic than arc welding. A single assembly may be welded partially by arc welding and partially by oxyacetylene welding, as in the case of motor mounts. Nevertheless, arc welding, in a great number of instances, is the only procedure which will produce the strength essential to highly-stressed components. It is well known that the most severely stressed of any commercial engineering assemblies yet devised are in an airplane. It is in just these members where arc welding is employed almost exclusively. Here, in essence, is the principal usefulness of arc welding in aircraft.

In World War 2, arc welding in

Welding the motor mount of a Lockheed plane.

—Courtesy Lincoln Electric Company

aviation builds structural fittings, mufflers, exhaust manifolds, axle and landing gears, struts, fuselages, gas tanks, boilers, beaching gears, accessories, engine bearers, levers, pulley brackets, frames for armored glass, cabin furnishings, and the pivoting yokes for those mammoth machine guns used in the Airacobras. Such was hardly the case during World War 1. Then the standbys were the wood and fabric airships, the "old toothpick jalopies." Nevertheless, a critical shortage of spruce in the latter stages of the war forced Germany to resort to metal components for aircraft. German fighter planes, with welded terne plate gas tanks and welded steel armor, were among the first applications of welding to aircraft. America's initial major use of arc welding for aviation did not arise until the late twenties, although the electric arc has been in general use ever since the carbon arc first served for street illumination in the nineties.



—Courtesy Lincoln Electric Company

Close-up of a motor mount

Early Development

The arc's earliest aviation applications were governed primarily by specific commercial forces. Certain manufacturers, for instance, possessed well-equipped foundries and were, in consequence, committed to the maximum use of cast components for particular assemblies. In certain areas, the availability of labor was based exclusively on riveted construction. A large-scale conversion to the arc welding process would have involved considerable capital expenditure on new plants and equipment, in addition to severe labor dislocations. Men of aviation hesitated. However, the initial hesitancy on the part of the aircraft industry as a whole to embrace arc welding practice has since held the procedure in particular good stead. It made imperative the development of suitable methods for qualifying welders, for controlling materials, and for inspecting welds. Early research in the field, by producers and users of welded equipment during the introductory spade-work period and since, has built up a large reserve of invaluable engineering data on the usability of the arc. Welding, as a result, has become vastly better able to enter the nation's aircraft industry as a thoroughly versatile process.

Competing Processes

Before we launch into a discussion of arc welding's role in aircraft, it would be well to consider briefly the various major procedures alternate to arc welding in aviation.

Resistance welding, in its several variations, has made notable contributions to production speedups. The most common form is spot welding: two pieces of thin metal are fused by the heat generated because of their inherent electrical resistance when an electric current streams through them. Unlike arc welding, there is no melting of the current-feeding electrode, whose resistance has been limited by the presence of copper and other resistance - minimizing ingredients. The decomposition of the electrode is further halted by the cooling action of a water jacket. Extensively used in the automobile industry, spot welding has been used increasingly in the aviation field, now that the problems of welding aluminum, due to its low melting point of 1,220°F and its tendency to oxidize, have been eliminated. An engineer of the Glen L. Martin Company estimated that when spot welding dominates a large portion of the aircraft construction procedure, with perhaps sixty welds applied simultaneously by suitable machines, America's plane output would be increased by at least thirty per cent.

Shot welding, a refinement of the spot welding procedure, has been expressly developed for stainless steel, whose great tensile strength—four times that of ordinary carbon steel—is destroyed when heated up to 1,100°F. The shot welding electrode stabs the metal for 1/10 to 1/120 of a second. Heat is introduced so instantaneously through the steel's danger zone and up to its 2,700° fusion point that the strength of the metal is unimpaired by the transition. Invented by the Budd Manufacturing Company and used in the building of stainless steel railway coaches, shot welding may make steel airplanes more featherweight than even aluminum assemblies.

(Continued on page 18)

NEWS OF THE COLLEGE

World-Mindedness

FOUR engineers participated in a panel on "World-mindedness," held in Barnes Hall Dec. 12. Each represented a different national background in the discussion, which culminated a series of five forums on problems of the post-war world.

Mateo Go, C.E. '42, of China, spoke of the results of the United Nations Food Conference. He stated that one of the primary responsibilities of Great Britain, Russia, and the United States after the war will be to improve the distribution of foodstuffs throughout the world.

Bal Kalelkar, EE '44, of India, made a strong plea for a square deal for India. He stated that thousands of his countrymen are now starving and that the British are failing dismally to meet the problem. Give India 25 years of freedom to work out its own destiny, he declared, and she will become a strong nation, eager to help and cooperate with the rest of the world.

Pedro Pi-Suner, CE '44, of Spain, stated that although he is proud of his own cultural background and wants to preserve it, he feels that internationalism is essential for the well-being of the entire world.

Pierre Yakovleff, ChemE '44, of France, gave as his opinion the statement that France at the end of this war should free all her colonies. While such action might be to his country's economic disadvantage, he said, it would add to the moral greatness of France.

Frank Anthony, of West Africa, asked that the spirit of the Atlantic Charter be applied to all men, including natives of colonies exploited by the United Nations. He emphasized that his countrymen deserved freedom in spite of the false argument that they are incapable of self-government.

Julian Jackson, Law, was chairman of the panel. The series of forums was sponsored by the Public Affairs Committee of CURW, under the chairmanship of Howard Samuely, ChemE '46.

The following were elected on January 7 to the CORNELL ENGINEER staffs:

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Edward H. Lannom
Ben-Ami Lipetz
James F. Mayer
Robert Pearson
Herbert Shprentz

Business Staff

Bernard A. Baer
Richard R. Bass
Melvin I. Goldfarb
Seth W. Heartfield
Inez M. Leeds
Joseph E. Nemeth
David M. Niceberg

Color Magic

THAT the artist is scientifically justified in painting blue shadows and that the eye can be fooled more easily than the ear was demonstrated at the December 30 meeting of the AIEE Student Branch by Professor Everett M. Strong of the School of Electrical Engineering. The spectators thoroughly enjoyed being fooled by Professor Strong's tricks and, incidentally, learned much that was new to them on the subject of color. For instance, they found out that when you mix blue and yellow light you don't get green but white, and that in general there are two ways of mixing colors: additive, of which the above is an example, and subtractive, the latter being represented by the common mixing of colored pigments.

Although he is especially interested in the field of color engineering, Professor Strong is quite versatile. The recent publication of his new textbook has established a name for him in the field of engineering education. His fame as an interesting and pun-loving lecturer is of long standing, and once again he provided his audience with both a pleasant and instructive evening.

On Friday evening, December 17, the AIEE sponsored a talk by W. R. Harris on "The Rototrol—Its Operation and Applications." Mr. Harris is employed by the Westinghouse Electric and Manufacturing Company and has recently been concerned with the application of the Rototrol to the paper industry. The Rototrol is a special machine designed for variable voltage drives, for speed control, and for accurate positioning. The machine has also found wide application for special purposes both in the Army and Navy.

Eta Kappa Nu

On January 5, following the initiation of three new members, the honorary electrical engineering society elected officers: president, Harrison Carlton Whitman; vice-president, Ralph Bolgiano Jr.; treasurer, Robert B. Trousdale; recording secretary, Laurence Weber; corresponding secretary, Thornton Stuart Lauber. The new members are: Joseph Eugene Bambara
Robert Page Burr
Burton Howard Smith

Following the initiation and election of officers was a banquet at Zinck's. The faculty and student members of Eta Kappa Nu had their former president Milton Stolaroff as toastmaster and as main speaker, Professor Lyman P. Wilson.

Civil Engineers

AT a meeting in Lincoln Hall on December 16, the Cornell student branch of the American Society of Civil Engineers elected Robert Benscoter, a V-12 student, president. Adrian Duncan was elected to the office of vice-president, and William Zuk to that of secretary-treasurer. The new officers will assume their positions and hold them until June, 1944. It was decided at this meeting that the members would all receive subscriptions to the CORNELL ENGINEER as a part of their membership, according to a plan similar to that enjoyed by the A.I.E.E.

(Continued on page 31)

"Loose Juice"

Collected by Bob Garmezy

Faculty Glossary

Instructor:

Bewildered young college graduate unable to succeed in the business world. Usually young enough to know several good jokes. Marks severely, as he is only one chapter ahead of his students. Lowest in the scale of student enemies.

Assistant Professor:

A promoted instructor. Promotion contingent on his lectures; when they become musty he becomes an assistant professor. Will start to write a textbook and get married. Encourage him and talk about his wife and baby.

Associate professor:

The most dignified member of the faculty. Originator of the working - my - way-through school racket. Sells his own books instead of magazines. Receives promotion for the same reason as a bus driver —number of years in service. Receives title, however, instead of gold stripe on arm.

Professor:

A ripe, disillusioned old man with over-ripe lectures.

—*Colo. Dodo*

* * *

Notice to Students in EE 406

Due to some misunderstanding concerning the type of materials needed in the laboratory and computation periods, the following list of materials will be brought to each future meeting:

1. Circle-drawing compass (i.e. one which draws circles; not to be confused with a north-pointing compass) with extensions (i.e. on the compass and not on the computations).
2. Angle-drawing protractor (for drawing straight lines at specified angles).
3. Drawing board (36″ x 48″).
4. T-square.
5. Triangles (30-60, 30-90, 60-90, 45-45, 45-90).
6. Scales (centimeter, engineer, and architect).
7. Reference books: texts for courses 410, 431, 435, 436, 437, 438, 441, 463, & 400. A cook-book is optional.
8. Drawing ink—5 colors.
9. Ink eradicator.
10. French Curves (2) K & E #187045692. Dietzen #806334b, type h.
11. 1000 ft. of #10 copper wire. Caution—Do not bring firearms or knives with blades over 6″ long to class.

* * *

What is so rare as a day in June?
Why, a drink on the house in a
Scotch saloon.
Where all the MacTavishes come
from afar,
And the pretzels are glued to the
top of the bar.
Where the glasses are never washed
any more
To conserve the residue left
from before.
And the bartender measures your
drink to the drop,
And seldom, if ever, fills one to
the top.
Where the whiskey is cut and the
gin is diluted,
And it really costs dough to get
well poluted.
And if you pass out and drop to the
floor,
They drag you around as they
make for the door.
This gives your suit an appearance
of slop,
But saves the bartender the price
of a mop.
Yes rarer by far than all days of
June
Are drinks on the house in a
Scotch saloon.

—*Colo. Dodo*

* * *

$64 Question

We notice the long faces and the lack of flashing smiles, clean shirts, and shined shoes in the ChemE. school. Is it true that Dusty, himself, gives out all excuses now?

WOES (Women of Engineering Schools) Are Here

Rumor has it that 17 woman engineers are at Cornell. Do they build up morale or do they provide distraction? Are they taking advantage of the boy girl ratio in engineering, are they just trying to help the war effort, or do they want engineering careers?

* * *

More Daffynitions

Zig Zag Connection is the train route from Ithaca to your home town.

Equivalent Circuit is the one you think you can figure out that you substitute for the one you know you can't.

Damper is a wet blanket at a party.

Copper loss is the police force death rate.

Exciter unit—a strip teaser.

Sharp cutoff—"No!"

Condenser—an important part of a bootlegger's equipment.

Heptode—a tube of "jive" listeners.

Screen grid—used for showing football movies.

Overload—two Mech labs, an E. lab, 12 other hours, and in the Navy.

Interstage—when she's pinned.

Push pull—the state of mind brought about by exams and a desire for a degree.

Class A transmitter—one out of a hundred professors.

Torsional vibration—the effect of home-made hootch.

Standing waves—Navy women at attention.

Analysis—that which we copy from our neighbors' papers.

Ultra high—a few more than even we wish to take.

Breadth Factor is the ratio of the width of your three year old tux pants to your own width with stomach contracted.

Inductor is the man at the Selective Service Center.

Phase is what you lose by taking an E.E. lab final.

Auto Transformer is the transformer you **ought** to get in place of the one you selected that burned out.

ALUMNI NEWS

Service To Aeronautics

DR. Sanford A. Moss of Lynn, Massachusetts, a graduate of both the University of California and Cornell, has been awarded the Sylvanus Albert Reed prize for 1943 by the Institute of the Aeronautical Sciences in recognition of his notable contribution to aeronautical engineering. The award will be presented at the Honors Night Dinner of the Institute in New York on January 24.

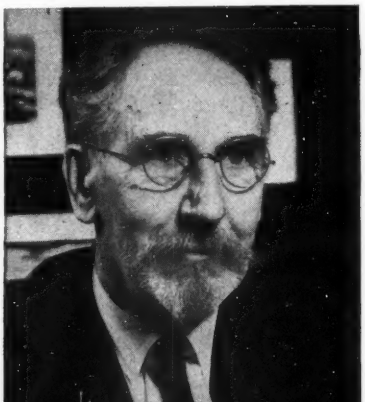
Dr. Moss has pioneered work on gas turbines, centrifugal compressors, and exhaust driven superchargers. He had worked on the latter with General Electric from World War I till the time of his retirement in 1938.

Graduating with a B.S. and M.S. in the class of 1896 from California, Dr. Moss obtained employment with the General Electric Company as a draftsman for a few years. Then he came to Cornell, first as a graduate student and then as an instructor. A thesis on the gas turbine earned him a Doctor of Philosophy degree in 1903 and another position with G. E. Working with Dr. Charles Steinmetz, he developed his ideas concerning compressors and gas turbines. In 1918, the government turned to him for the solution of the problem of giving military planes greater power. His answer was the now famous turbosupercharger. This enabled the engine to "breathe" normally at high altitudes.

Dr. Moss continued his supercharger research until he retired. In 1941, he was called back as a consulting engineer for G. E. to help further develop them.

He received the 1940 Collier Aviation trophy jointly with the Army Air Forces for outstanding success in high altitude flying by development of the turbosupercharger, and he also received one of General Electric's Coffin Awards for his work. In 1943, the University of California awarded him an Honorary Degree of Doctor of Laws.

Now at the age of 71, he holds 46 patents on his mechanical devices. He is also a life member of the American Society of Mechanical Engineers, having taken some mechanical engineering at California.



—Courtesy General Electric Company

Sanford A. Moss

The Sylvanus Albert Reed award was endowed in 1933 through a bequest by the late Dr. S. A. Reed, and is given annually for outstanding achievements in the aeronautical sciences. In 1942, it was awarded to Igor Sikorsky of United Aircraft.

Reunion In China

ONE of the Cornellian Reunions unique in Cornell's annals took place in war-torn China at Kweilin, in Kwangsi Province, the evening of October 22, 1943. The Chinese Institute of Engineers were assembled in convention during the week discussing engineering society matters and running a power show less than 220 miles from the Japanese stronghold at Hongkong. Cornell men took off one evening to welcome Paul B. Eaton, M.E. '11. Professor Eaton, formerly head of mechanical engineering at Lafayette University, and previous to that an instructor in Machine Design at Cornell from 1914 to 1915 and from 1920 to 1923, was on a mission to China from the Department of State.

E. F. Wei, ME '12, the "Dean of Chinese engineers," presided over a meeting typical of Cornellians wherever gathered. The Alma Mater started the dinner and the Evening Song ended it. Meanwhile stories were told, jokes were cracked, and the Cornell of today was related by Professor Eaton to 23 of the alumni, who listened with keen interest. These Cornell men are doing their part to maintain their country against the ravages of a wily and cruel enemy. Some are building railroads, some are operating power plants and factories, while others are designing bridges for postwar construction, and aiding as technical advisors to the government or as research workers.

The alumni present at the dinner includes E. F. Wei, '12; H. C. Chiu, M.C.E. '18; C. Y. Hou, M.C.E. 19; L. H. Shen, M.M.E. '18; Y. C. Mar, C.E. '19; S. T. Hsu, M.C.E. '20; I. H. Pepi, M.C.E. '30; M. S. Kwei, E.E. '22; C. Y. Tu, C.E. '22; C. L. Nish, M.C.E. '23; Y. K. Wong, M.C.E. '25; H. K. Chang, M.C.E. '30; and also Y. T. Ku, Ph.D. '30; K. H. Shih, M.C.E. '30; W. J. Wang, E.E. '31, Ph.D. '33; S. C. Chen, M.S. '32; Y. M. Wang, M.E.E. '32; P. C. Lee, M.C.E. '36; C. J. Wang, C.E. '36; F. O. Feng, M.S. in M.E. '38; and C. Yu, Ph.D. '40.

(Continued on page 24)

Tau Beta Pi Essays

The two essays on this page complete the series, begun in our last issue, of essays selected from those submitted as part of the pledge requirements of Tau Beta Pi, national engineering honorary society.

FINE ARTS

By Ralph Bolgiano, Jr., EE '44

I HAVE heard many a modern, methodical engineer refer to the fine arts somewhat in disgust. Apparently they feel that to put one's time into such works when the world is still so unbalanced mechanically and economically is a pure waste of valuable hours. Possibly this brief anecdote will serve to disprove their theory in part, at least.

Life was not all sunshine at times like these. Young Joseph was, perhaps, a very fortunate fellow. He had escaped from his homeland in the first year of the war and had come to this country of promise. Thus he had missed the worst of the horrors of that terrible conflict. During the first few years of his life on this side of the ocean there had been time for nothing but work. It was a big job defeating the forces which had caused so much misery. But now that was all over. There was time to think. The days seemed longer; things did not always turn out as one hoped they would. Though his future lay clear and straight before, there were many days when the road was obscured by the dust of those who had gone before. Joseph would come home, feeling depressed. His mind had wandered all day long, but his thoughts could not be put on paper. Nor could he explain them to Wilhelm, with whom he lived. Nevertheless, Joseph was a lucky lad.

He would sit at the piano, sad and confused. Slowly his fingers moved from key to key. There was no melody to his playing; only a sequence of mournful chords. Note by note he vented his over-stressed emotions. Then finally the music seemed to find itself, as the chords fitted together into melody. It was nothing that had ever been heard before; but it was beautiful and soft—like the coat of a lioness. Suddenly the creature's fur bristled with a crackling sound and a discordant snarl escaped between her yellow fangs. With swift, staccato motions she mounted to a position of advantage above the trail. There she crouched, muscles tense, growling under her breath. But the human she had scented did not come. For a moment she wavered then crashed to the ground and with muffled paws ran to the gate of her cage, where her dinner lay on the stone floor. Never would she conquer this instinctive desire to kill man who had taken away her freedom, though now she purred melodiously.

Joseph smiled easily as his fingers idly wandered over the keyboard. Little did he realize it, but deep within his soul was the certainty that there would be a day when he would overcome his deeply rooted hate of the beasts who had driven him from his home.

Thus, Joseph had risen from the depths of confusion and sadness to a free and easy state of mind. And only because he was capable of expressing in music the feelings which he could not put into words. So it goes throughout life, day by day. Without some mode of self-expression our deep, intangible emotions are pent up within us till nerves begin to crack. We bog down under the load of heavy thoughts. But give us just some simple means of expressing what we cannot say, whether it be by music or painting, prose or poetry, and we will relieve the tension which ties our lives in knots. We will never know a misery which has played havoc with the happiness of countless men and women.

FREEDOM IN BLACK AND WHITE

By Moody C. Thompson, Jr. EE '44

FOR decades there have existed in this country different minority groups who, because of race, religion, or ancestry, have been refused the rights and privileges normally accorded the majority of the population. That these practices of discrimination are still in existence is no secret, and the situation is quite widely discussed.

Would it not be better perhaps, considering the present state of world affairs, to ignore this internal problem? Dissension within the nation may well result in delaying the final victory.

Yes, perhaps that would be safer when considered from the immediate point of view, but this war is being fought, fundamentally, to release the oppressed minorities of other parts of the world. It is our objective to rid the world of all who are reluctant to accept their fellow-man as their potential equal.

This is an undoubtedly high and worthy goal for which to strive. However, even the casual observer can not but wonder at the extent to which this show of "equal rights for all" is made, while the same newspapers which carry the stories of good-neighbor policy and international friendships tell of riots, labor discriminations, and other numerous instances of persecutions of minority groups within the boundaries of this nation itself. And what makes the whole situation even stranger is that thousands of men representing these same suppressed groups are fighting and dying each day to save and protect the freedom and liberties of a country which denies them these very privileges.

It cannot be denied that considerable progress has been made toward the elimination of racial and religious barriers, but it should not be forgotten that there is still much to be accomplished before the people of this nation can, with clear conscience, point the finger of accusation at any other society charged with discrimination.

The idea of an overnight reformation is, however, a dangerous, if not impossible, plan. A much more desirable method of solution would be discussions between members of labor, business, and religious organizations, and members of the minority groups. But even this type of discussion, no matter how intelligently or diplomatically conducted, would be doomed to failure

(Continued on page 28)

PROMINENT

Ralph Bolgiano

Ralph Bolgiano, Army

PFC. Ralph Bolgiano was battling a cold and cough when interviewed at his barracks in the former Delta Chi house. Despite his miseries, he was able to sketch an outline of his life up to date.

Hailing from a suburb of Baltimore, Maryland, Ralph prepared at McDonogh. Although he decided a short time after he was born to eventually become an E.E., it was not until he was about two or three years old that he decided to follow in the footsteps of his Dad (M.E. '09) by coming to Cornell. A John McMullen Regional Scholarship awarded to him at the conclusion of his high school career sealed the decision and sent the blonde freshman to Ithaca in September, 1940.

Between September, 1940, and May, 1943, at which time he entered the Army as a member of the Junior R.O.T.C., Ralph gained a small measure of fame at Cornell. In his freshman year he won his numerals for swimming, rowed with the Frosh 150, and joined the Yacht Club. Meanwhile, his schoolwork was of such quality that he earned a place on the Dean's List. In his sophomore year, Ralph further widened his activities. He swam with the varsity swimming team, won the managership of the frosh crew, was active at his fraternity house, Delta Upsilon, and made Dean's List again.

In his summers Ralph was employed at the Bendix Radio Corporation in Maryland, helping make equipment for the Army Air Corps. During his first summer he worked as an apprentice in a crystal lab where he spent his time doing testing work and odd jobs. The following summer he was able to get into Radar work, so he became a group leader working on Air - Ground Intercommunication for the Army Air Corps. Bolgiano admits that he enjoyed his job, inasmuch as he had six women working in his group. Furthermore, on weekends he was able to go down to Annapolis where he relaxed on a friend's cutter.

Coming back for his junior year, Ralph turned on the steam. According to him, all of his time was spent in Mech Lab. But evidently he was busy during his lunch hour, because he accomplished many other things. Besides being elected to a few societies, he made Dean's List again and maintained one of the top positions in the EE junior class. Specifically, Ralph was elected to Eta Kappa Nu, Tau Beta Pi, Red Key, Kappa Beta Phi, and Pi Tau Pi Sigma. As an athletic junior, speedster Bolgiano tied for first place in the Cornell six-day bike race. He didn't neglect his position in the fraternity, either, for he held the position of steward and house manager.

After the Army called him to active duty, Ralph spent two months in various reception centers and finally ended up in a Signal Corps base, Camp Crowder in Missouri. The Cornell recruit did his stint there, surviving the heat and the G. I. life to return to his Alma Mater at the beginning of this semester. Since that time he has been struggling to hit his stride. On his own testimony, it took him two weeks before his brain showed any signs of returning to normal. Now it seems that the battle has been won, and Ralph is once more rolling along.

Outside of school, Ralph is an ardent tinkerer and a past master at building radios. Other principal interests are riding and sailing. As a captain of cavalry in his senior year of high school, he says that he thoroughly enjoyed himself. As for sailing, anything in or about the water seems to fascinate him. In his younger years he would spend the entire summer on a boat with his Dad. At Camp Crowder, he found no water—which was quite a disappointment.

After the war Ralph intends to come back to Cornell for some graduate work in electronics. Following that he would like to get into Bell or R.C.A. doing experimental work in communications, with a special interest in the telephone. Until that time he will continue to serve the Army with his electrical abilities.

Edward H. Carman, V-12

EDWARD Horace Carman III, senior in mechanical engineering from Baltimore, Maryland, is one of the very few, if any, Sibley engineers who can claim the title of Certified Ship Welder. Those familiar with it know that ship welding, despite the recent mass production of female welders, is a difficult and arduous craft. Ed began as an apprentice at the Bethlehem shipyards after his graduation from Baltimore Polytechnic in February 1940. Seven months later, after crawling through countless cramped passageways and welding plate deep in the interior of the steel merchantmen, he passed a stiff examination to join the fraternity of certified welders. With this skill and a family background in mechanical engineering at Cornell be-

Ed Carman

hind him, he entered Sibley in September 1940.

Ed has done very well scholastically in his four years, starting by winning a McMullen Regional Scholarship and crowning his achievements with election to Tau Beta Pi, national honorary engineering society. However, he believes that booklearning alone is not enough, and he has born out his belief by actions.

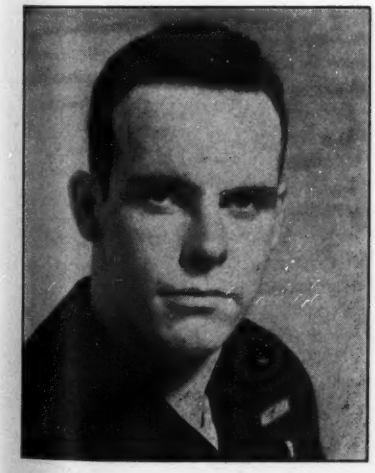
In the field of sport, his home town's passion for lacrosse has predominated, and Ed has played goalies on both freshman and varsity lacrosse teams. Baltimore, which goes "all out" for lacrosse as Boston goes for baseball, witnessed Ed's performance as goalie for the North team in the annual North-South game played there last June. Ed also made the All-American lacross squad this season.

Organizations and honorary societies on the hill have also seen much of Ed Carman. Ed admits freely that he enjoys meeting and associating with people, particularly when there is a party spirit and beer on hand. A member of SAE fraternity, he is vice-president of the house at present. Ed holds the treasurer's office in Red Key and also in Atmos, honorary mechanical engineering society, and in addition sports the pin of Sphinx Head. One of his numerous activities which Ed recalls with pleasure is his service on the Sophomore Cotillion committee. Although only a mere committee member at the time, he still enjoyed himself greatly working for the dance, and recalls, though somewhat dimly, that it was a success.

Ed has been in Navy blues since the summer term, and now only a few weeks remain before he graduates and is sent off for active service. Ed joined the Navy program primarily out of love for the sea and ships; in addition to his now three summers experience in ship construction, Ed has seen actual maritime service. When he was sixteen, he travelled up and down the coast from Maine to Texas, working for four months as an apprentice seaman aboard an oil tanker. It was a rough life, but Ed found the conditions rather reasonable and the "gang" a tough but likeable group.

After the war, which he predicts will continue for at least two years following the fall of Germany Ed plans to enter into sales or administrative work. As yet he is uncertain of its exact nature, but hopes that some "route course", such as given by Bethlehem and other companies, will help him to select his spot. But for now he is looking forward to the sailor's life, so Ed hopes to be out Jap-hunting on a cruiser or destroyer as soon as possible.

George Bishop



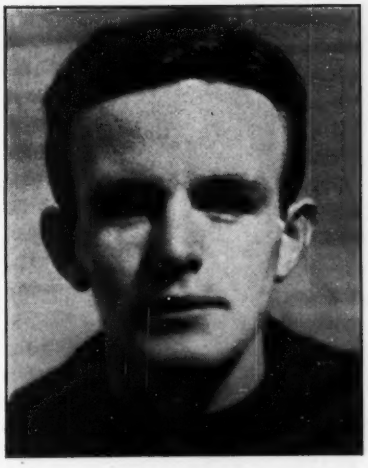
George Bishop, V-12

Among those born on October 4, 1922, was one George Bishop. He first saw light in Baltimore, Maryland, and Baltimore has been his home base ever since. But his spirit of wanderlust cropped out at an early age when he and the three other boys in his school were continually forced by the eight girls to skip rope. So George started a nine year session at McDonough Military Academy in Maryland. He no longer skipped rope but made the wrestling team and the J.V. football team. He also held the record for having the most demerits without getting extra details to perform.

When a junior in high school, George came to Cornell for Cornell Day with some Baltimore alumni. Cornell's good scholastic reputation and tales of regular "college life" clinched his decision to come here. And his record has proved the wisdom of his choice.

As a freshman George earned his numerals in freshman lacrosse, went out for wrestling, was on the Snow Ball Committee for C.U. R.W., and made Dean's List. In fact, he has been on the Dean's

(Continued on page 28)



Bob Benscoter

Robert B. Benscoter, V-12

If you wish to see Robert Barrington Benscoter, ask for Ton, Barry, Benny, Jughaid, or Beanshooter. Benny's Holland Dutch ancestors tried to avoid this sort of name trouble by changing their name from Van Benschoten to Benscoter when they first settled in northwestern Pennsylvania, but evidently the change they made was not drastic enough.

As far as his Cornell activities are concerned, Benny has brought no disgrace to the Benscoter name. At the present time he is president of the Wesley Foundation, which is a Methodist church group in the Cornell United Religious Work organization; a member of Tau Beta Pi; president of the Cornell student chapter of the American Society of Civil Engineers; and president of Chi Epsilon, honorary civil engineering society. In the latter capacity, he is busy developing a program of research in either soil mechanics or structural work for the Chi Epsilon members.

Benny came to Cornell from

(Continued on page 28)

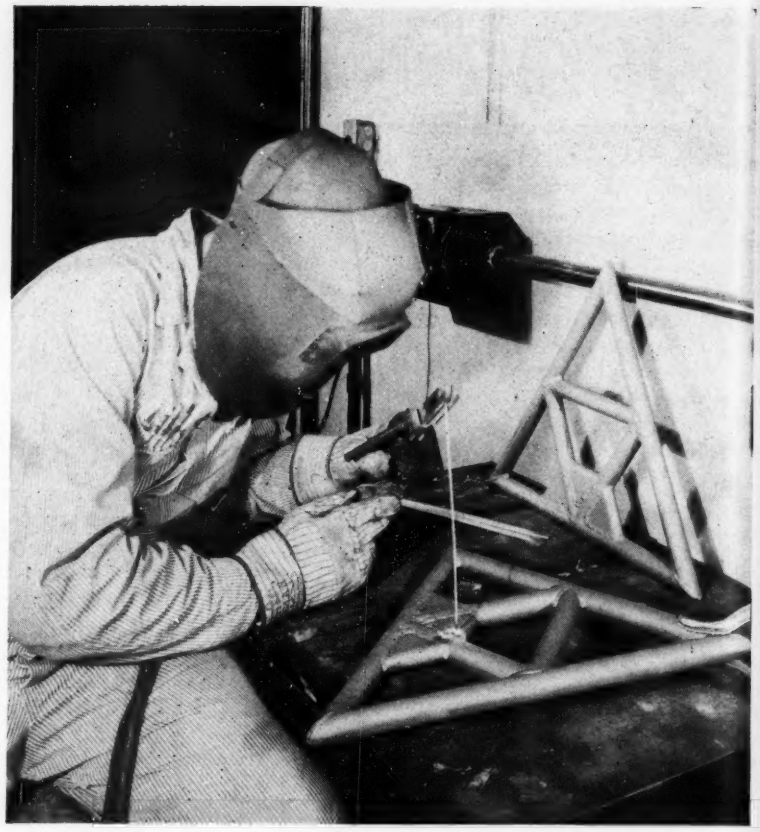
Arc Welding In Aviation

(Continued from page 11)

Heliarc

Two years of research by the engineers of Northrop Aircraft were rewarded by the development of the Heliarc, which, for the first time, makes feasible the much-heralded fabrication of all-magnesium airplanes. While magnesium has been used for some time in the aircraft industry for engine parts, wheels, and accessories, it has never found extensive application as a primary construction material, essentially because welding was totally impractical. The achievements in welding have had as their companion piece the growth of processes for making magnesium less inflammable and considerably more heat resistant. In Heliarc welding, a shield of helium gas is injected into the arc, enveloping the molten metal. Because helium is chemically inert, it minimizes oxidation and eliminates the bugaboo of fluxing agents, consequently preventing the danger of entrapping flux in the weld ingot, which will accelerate corrosion. Helium has over five times the specific heat of air and, when in motion, prevents heat accumulation near the weld. This keeps the weld cool, thus providing superior fusion and penetration with vastly less distortion than possible with any previous process.

In oxyacetylene or gas welding, a flame produced by the burning of oxygen and acetylene is played on the surfaces to be joined. Additional metal is fed to the junction between components by melting away a filler rod of the required composition. Although the expense for gas welding is low, operating costs are excessive. Because the flame rebounds and fan-tails away from the weld, warping of parts is common. The cost of heating by the gas process is about three times greater than that in arc welding, and less than one-third of the heat input goes into making the weld, the rest being blown away by the very action of the flame itself. The gas used is obtained by the consumption of electrical energy. This circular traverse from electricity to gas to heat is roundabout, therefore wasteful. Speed of gas manipulation is one-quarter less. The arc is a far simpler mechanism to operate, in that heat and flux are combined in a single instrument, as compared to the separate rod and torch used in oxyacetylene welding. Additionally, a preliminary heating-up period is required with gas. Striking of the arc is followed instantaneously by the welding temperature. The electrode holder is slightly lighter than the gas torch, and there is the further advantage of obtaining the power supply directly from the plant electrical system; shipping and storage of gas cylinders provide problems in themselves. The arc permits the successful welding of widely dissimilar metal thicknesses, impossible with gas. Less annealing effect, and only close to the weld, at that, provides greater strength of fusion.



—Courtesy Westinghouse

Welding tubular parts with a high frequency electric arc.

Riveted Construction

Unlike riveting, welding requires no duplication of materials at joints. Arc welding at three points gives strength equivalent to four or five rivets. Where the arc is employed, the cohesion of end elements doubles, accompanied by a similar increase in strength and rigidity. The enhanced service life of the welded construction lies in the fact that once a bolt loosens in the relatively thin sheet-metal now in general use, the bolt hole rapidly elongates. Play between members results. In contrast, if properly made, arc welded joints under no circumstances weave. The plates are full-strength; there is no greater likelihood of failure at the joint than at any other point along the construction. In fact, the member is stronger at its arc weld than anywhere else, essentially because of the perfect fusion possible with rod metal of a quality superior to the base metal welded.

Furthermore, in considering riveting, there is a tremendous waste involved in making every structural member larger and heavier than needed, solely to provide the necessary strength at the rivet holes, where the metal has already been weakened by drilling. One arc welder can do the work of a riveter, a catcher, a heater, and a bucker-up—four workmen replaced by one. In riveted constructions, time and energy is con-

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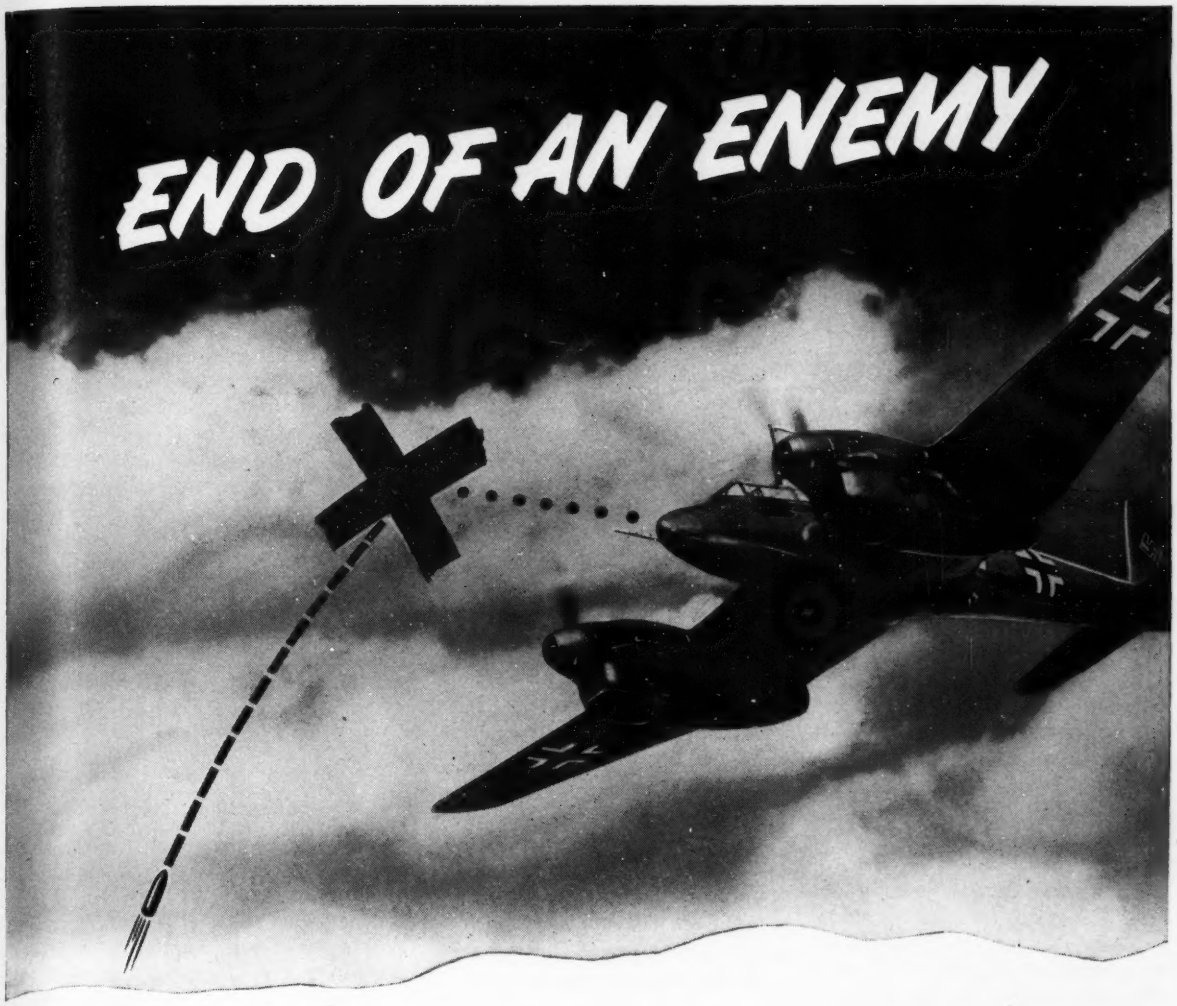


. . . engineered at Western Electric

In a split second this enemy plane will be blasted from the skies by a shell from one of our anti-aircraft guns.

How is it possible? Just think of the mathematical problems involved in hitting a plane going 300 miles an hour 20,000 feet up . . . when it takes the shell 15 seconds to get up there and in that time the plane has gone more than a mile! Besides, the shell curves in its flight. Wind blows it. Gravity pulls on it. Even the weather affects its velocity.

The greatest mathematician could never solve these problems in time to hit the plane. But engineers at Bell Telephone Laboratories and Western Electric have designed and produced a Gun Director—*an electrical brain*—that solves them instantly!

It plots the plane's height and course—continuously matches the curved path of the shell to the path of the plane so the two will meet. It aims the guns—even times the fuse to explode the shell at the exact instant.

Putting the 3300 parts of this electrical brain into production called for the development at Western Electric of many special tools, machines and manufacturing methods. Mechanical, electrical and industrial engineers cooperated with chemical and radio engineers in this work.

Making the *electrical* Gun Director is just one of many interesting assignments in Western Electric's vast war production job.

Till the last enemy plane is knocked down, buy all the War Bonds you can!

Western Electric

IN PEACE...SOURCE OF SUPPLY FOR THE BELL SYSTEM.
IN WAR.. ARSENAL OF COMMUNICATIONS EQUIPMENT.

Arc Welding In Aviation

(Continued from page 12)

sumed in superfluous paper work. Each riveted joint must be precisely designed, the size of each rivet determined, the location of each rivet specified. Time and energy is wasted in the template shops, where full-sized cardboard, wood, or metal patterns, duplicating every structural member, must be prepared with such accuracy that each hole will register with a hole in one, two, or three additional members when assembled. This routine entails extreme care and technique—much of which may be dispensed with through the use of arc welding. In addition, arc welding shows liberal advantages in the field of plant overhead. One arc welding setup alone can weld enough spars for the mass production of airplanes. Arc welding is quick, simple, and direct. Riveting is slow, tedious, and costly, and also demands considerable floor space.

Arc Welding

The arc welder's tool is a pencil-shaped electrode which melts away like a candle. So hot is the welding arc that if it is maintained in a fixed position for more than an instant, it will rip a hole through tremendously thick plates of metal. The arc is struck by momentarily touching the electrode to the plate and then withdrawing it to about a quarter of an inch from the base plate. When the electrode is connected to the supply, one terminal at the electrode and the other at the plate, the current sparks across the gap first formed, causing the air to become ionized. As a result, the current is able to continue across a gap of even several inches. The electrode must always be touched to the plate at the outset, since even the smallest air gap will prevent conduction of the current, at least at the voltages used in welding, unless contact of the electrodes is first achieved. Under the intense heat developed by the arc, a small portion of the base metal is brought to its melting point almost instantaneously. The tip of the metallic rod is likewise melted, forming a globule which is then carried across the arc, perhaps at a rate as high as two thousand drops a second, and deposited in the molten seat already formed in the parent metal. The transfer is accompanied by a succession of momentary short circuits, transiently extinguishing the arc. The globule formed is actually carried across the arc and not merely dropped, as gravity does nothing more than assist the deposition. That a globule may be deposited overhead, counter to the force of gravity, is evidence that the process is actually one of deposition.

Without additional preliminaries, let us consider the special usefulness of arc welding in the aircraft industry, as compared with several alternate processes.

At 450 miles an hour, the turbulence or aerodynamic drag caused by button rivets, or even by improperly driven countersunk rivets, may cut aircraft operating speeds by as much as ten per cent. It is noteworthy that high-speed air transports, if scrubbed free of dust, dirt, and grease at each landing, will exhibit such critically reduced air drag that, by way of fuel saving, the operation amply repays the company for the supporting of a crew of anti-dust-dirt-and-grease monkies. Welding of wing skins, leaving a comparatively smooth exterior, impossible with riveting, is essential to the production of the type of high-efficiency airfoils which will guarantee unimpaired surface continuity.

Building Beaching Gears

The Kenworth Motor Truck Corporation has been able to arc weld beaching gears for the giant Clippers at 68.3 per cent of the former riveting cost. Beaching gears are somewhat on the order of a truck base on four dual tires. The gear is floated out on the water's surface, side attachments of empty oil drums serving to buoy it up. After being submerged beneath the belly of an airship, it and the plane on top are towed through the water, up the ramp, and into the hanger. Designed to support a load of over forty tons, a typical unit, of some seven tons of mild steel and practically a ton of rubber, employs 1,200 feet of arc welds and 190 pounds of electrodes. While it took 160 manhours and $210 to complete the jigs and templates necessary to build the beaching gear by the riveted design, the arc welded construction demanded 30 manhours and $28 to install positioning apparatus. Through arc welding, a saving of 26 cubic feet of volume, tantamount to 1,564 pounds of displaced weight, was yielded simply because arc welding had eliminated rivets and parasitic flanges. Some 3,126 rivets alone totalled 650 pounds. In the final tally, the arc welded assembly proved to be 3,350 pounds lighter than its riveted predecessor.

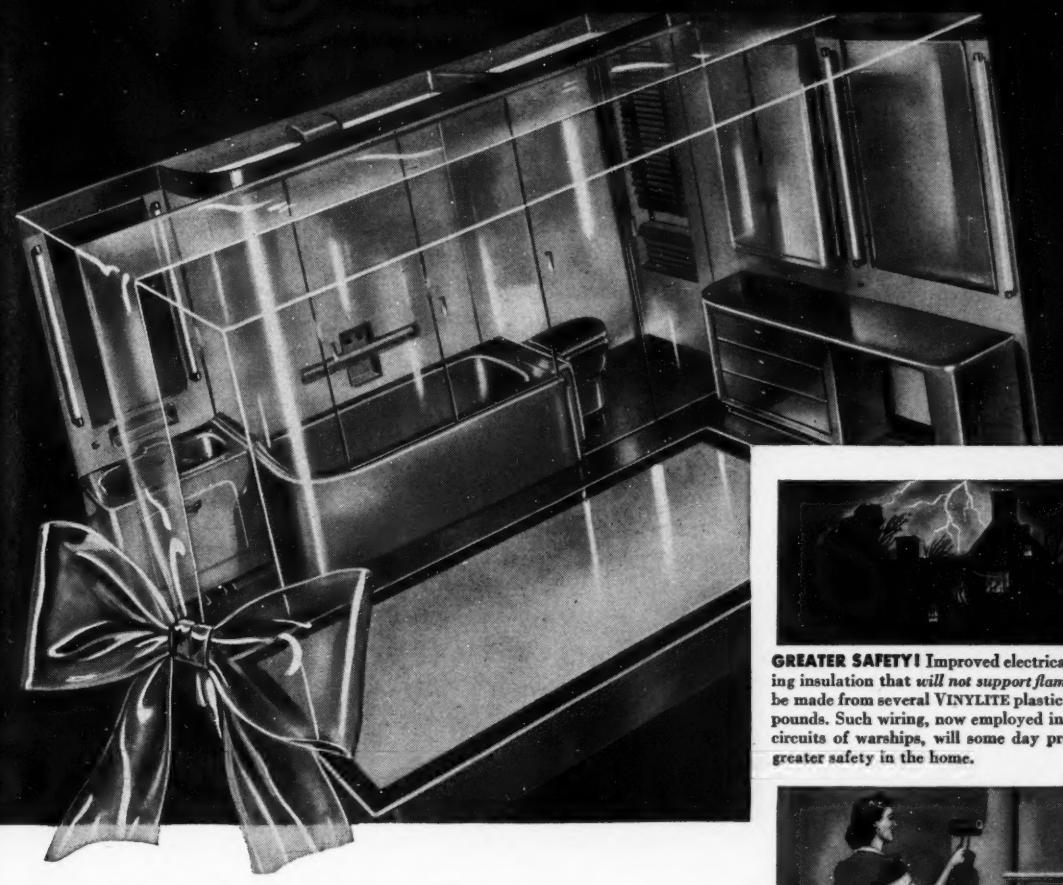
In the building of amphibian planes the chemical action of salt water must be rigidly accounted for. Arc welding solves the problem with customary ease. No crevices between plates, as exist in riveted lap joints, provide entering wedges for corrosive agents. Free surfaces insure not only protection again corrosion, but furthermore, a far less corrugated appearance. Prey to twisting and bending loads a riveted construction will develop slippage between rivets and plates, thus constantly demanding repair to guarantee reasonable water-tightness. The welded construction, needless to say, produces a single, rigid section. Once water-tight, it remains so.

Welded Landing Gears

The landing gear is necessarily the most rugged part of an airship and therefore makes use of the heaviest aircraft welding outlays. In the manufacture of landing gear forks, the Lockheed Aircraft Corporation, by converting its technique to arc welding, produced welds 23.6 per cent stronger than those obtainable formerly, with eminently greater uniformity in the structure of the weld. The time necessary for the building of gear forks was reduced from sixteen hours to eight hours, producing a labor saving of twenty dollars per fork. Tests on speciments of welded gear forks have shown tensile strength of 98,160 pounds per square inch, as against 79,390 pounds per square inch for structures manufactured by oxyacetylene. It took nine hours to build a complete gear fulcrum by oxyacetylene. With arc welding, in eight hours, a welder may turn out two-and-one-half such fabrications. Again the arc equates speed with higher production quality.

Before the inception of arc welded construction, boilers on the American Airlines' fleet were surviving the meager average life ex-

(Continued on page 22)



Plastics Will Mean Better Homes

. . . *and more of them!*

EVEN TODAY, plastics men can vision a bathroom with practically everything in it made of plastics or containing plastics in some form. Imagine such a bathroom, costing less to manufacture, to ship, and to install, delivered *as a unit* to your home!

The raw materials to make better homes with more bathrooms and finer kitchens come true are *in existence today* . . . in VINYLITE and BAKELITE resins, and plastics made from them.

BAKELITE resin-bonded plywood, like that from which planes and torpedo boats are made, can be used to make floors, walls, ceilings, and furniture.

The type of plastic film used in waterproof, chemical-resistant food bags and rifle covers can be fabricated into mildewproof shower curtains. VINYLITE resins can also be made into rot-resistant floor coverings that can be walked on millions of times *without showing appreciable wear!*

Our engineers know from the record of VINYLITE plastic-coated life raft sails, sleeping bags, and life preservers, that VINYLITE plastics and compounds can be used in the future to bring you wall coverings, window curtains, and furniture finishes that will outlast anything now available.

Under heat and pressure, VINYLITE and BAKELITE plastics can be molded into numberless useful forms. Experience gained in molding war equipment will help to bring you such things as molded plastic furniture which will be lighter, easier to move, easier to keep clean!

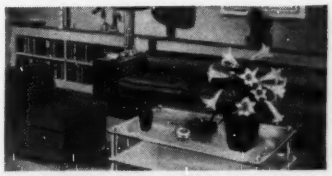
Spun plastics made from vinyl resins are resistant to rot. Right now, such plastics are used for making jungle hammock ropes and vital chemical filters. They also can be fashioned into draperies, upholstery, stockings, and other articles of clothing ...sun-proof, water-proof, and moth-proof!

VINYLITE and BAKELITE resins and plastics, and many new techniques for using them, are peacetime research achievements of CARBIDE AND CARBON CHEMICALS CORPORATION and BAKELITE CORPORATION, both Units of UCC. Fabricators converting these raw materials into finished articles are making them mean more and more to you.

GREATER SAFETY! Improved electrical wiring insulation that *will not support flame* can be made from several VINYLITE plastic compounds. Such wiring, now employed in vital circuits of warships, will some day provide greater safety in the home.

MORE BEAUTY! *New washable* water paints based on BAKELITE resins, will bring new beauty to homes. These paints are inexpensive . . . and *easy to apply!*

LESS EXPENSE! Use of BAKELITE molding plastics in making washing machines, refrigerators, and many other household devices and fixtures can mean lower-priced, longer-lasting equipment for you.



LESS WORK! Easier cleaning of plastic-treated walls, ceilings, and floors. Plastic furniture and upholstery that are easier to keep clean. Yours in the future!

BUY UNITED STATES WAR BONDS AND STAMPS

UNION CARBIDE AND CARBON CORPORATION

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The Oxweld Railroad Service Company
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PLASTICS
Bakelite Corporation
Plastics Division of Carbide and Carbon Chemicals Corporation

Arc Welding In Aviation

(Continued from page 20)

pectancy of seventy-five hours. During the winter of 1936-1937, the superintendent of maintenance received forty complaints a month from commuters who had been obliged to travel in dank, steam-filled cabins, because of breakdowns in the airship's heating system. When arc welding was adopted, however, the first welded boiler accounted for 420 hours of duty without repair. In 1937, all of the American Airlines' boilers were replaced by arc welded constructions, which have since become the prototype of boilers used everywhere throughout the aircraft industry. To date, not a single failure in boiler service has been attributed to tubular failure at the weld. Airplane corporations may now purchase boilers which, because of arc welding, have five-and-one-half times the service life of former assembles. American Airlines built the old constructions at $84.08 each, while the arc welded fabrications of today, because of decreased production manhours, cost a well-reduced $52.17. Carrying these quotations into the larger dimension of their total effect upon American Airlines, it was found that the company realized a saving of $33,340 a year merely because of conversion to arc welding.

Plant Accessories

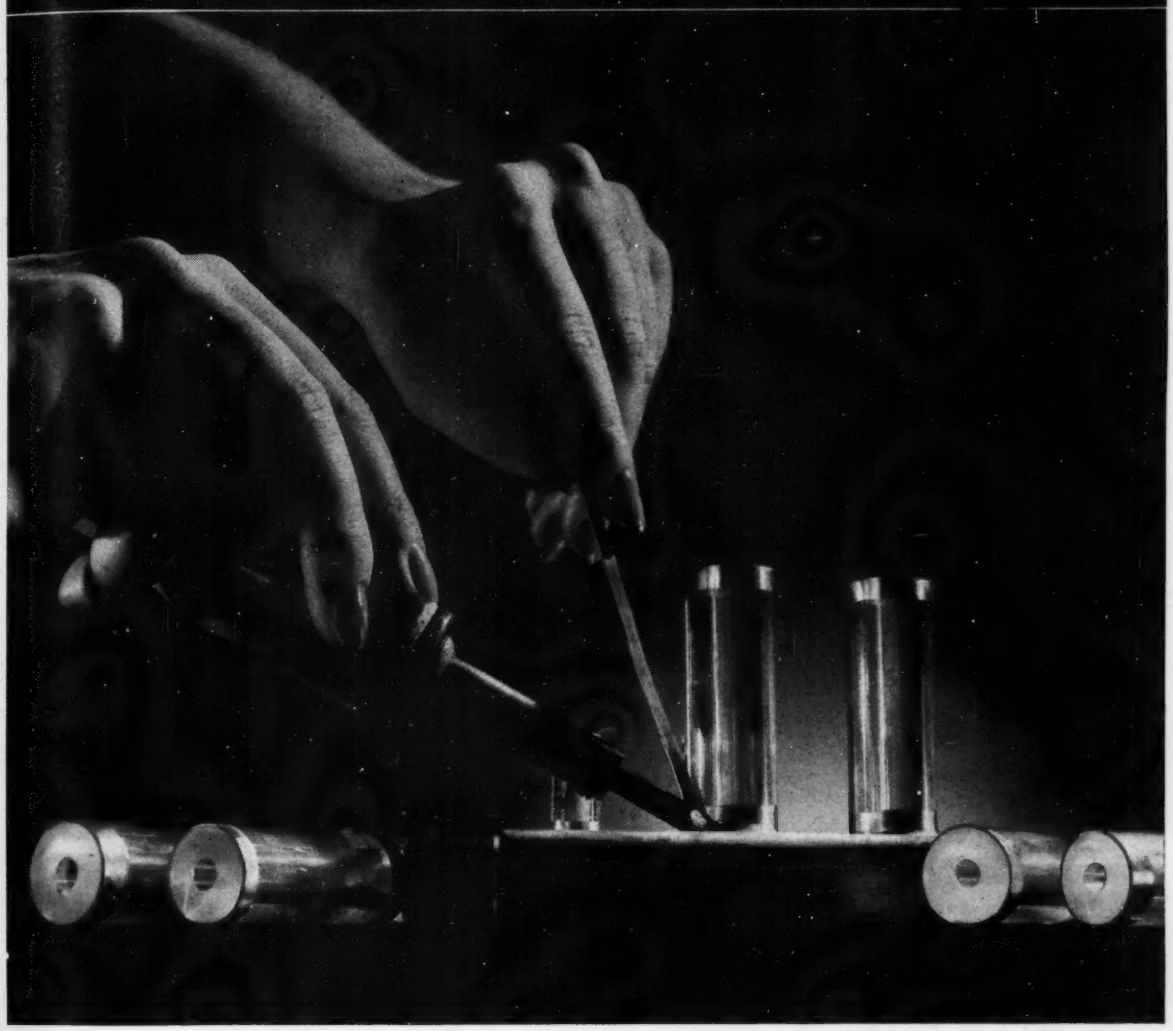
In keeping with the aircraft industry's demand for strength accompanied by lightness and rigidity, aircraft manufacturers employ arc welding in the construction of plant accessories. A framework for bringing up an airplane wing for attachment to a fuselage under construction is an arc welded assembly of 1½-inch, 16-gage welded steel tube. Trestles and platforms for manufacture, repair, and inspection are arc welded. Arc welded, tripod-shaped trestles serve to tow the nose or tail of an airship. Arc welding constructs the giant metal chairs used for bombsight practice.

Arc welding builds the cooling circulatory system for the newly-innovated liquid-cooled airplane engine. The inroads that welding has made into tank construction have been paralleled by its use in the design of airplane armor plate installations, where superior resistance to shock and penetration takes the lead over cost savings, however significant these may be. The tail wheel, that small retractable component which shoulders the weight of a ship's rear during taxiing about the ground or in landing, is another arc welding achievement. Contractors of the Boeing Aircraft Company call arc welding into play in the manufacture of bullet-proof gas tanks of the type designed for the flying fortresses. The arc's prime bids for recognition are increased welding speed, lack of distortion, welds of uniformly high quality, and lower costs of welding, as compared with competitive procedures.

As an indication of the vastly increased use of arc welding throughout industry generally within recent years, steel manufacturers report that the consumption of welding rods in 1941 amounted to 450 million pounds, a 2,800 per cent increase over 1931. While there were 75,000 American welders in 1939, today that figure has spiralled to 280,000. In 1933, arc welding accounted for only 13 per cent of a 34-million-dollar steel industry. In 1939, it represented 25 per cent of a 73-million-dollar industry. Where present expansion will end, no one

(Continued on page 24)

Imagine soldering metal to Glass!



HERE'S one for the book! The young lady is soldering metal to glass to make an important piece of electrical war equipment, and she doesn't have to be fussy about it either. She just solders!

The reason this can be done today is that some time ago Corning developed a method of firmly attaching a thin film of metal to glass, as a base for the solder. It was just one of many glass-metal problems that were once called "impossible."

Being ready with ideas has been the glass industry's greatest contribution to our war effort. That, and the ability to mass produce essential glass without delay.

Take Corning for instance. Here research found ways to mass produce essential optical ware. Insulators, aerial and naval navigation lenses, bulbs for electronic tubes, these and countless other war needed items are being turned out in vast quantities.

On the civilian front, Corning right now is supplying glass piping, and valves, nuts and bolts that resist chemical attack. Glass springs that apparently never wear out. Glass acid pumps that replace scarce metal alloys and give longer service in the bargain!

Glass isn't taking a back seat now, or after victory. Too many people are finding out something about its unusual qualities to ever let this happen.

They are discovering that glass is versatile. It has astounding strength. It can be shaped with great accuracy. It resists corrosion and abrasive wear. And they're finding out, too, that Corning knows glass, not only as a producer but as a developer of glass ideas.

In engineering, too, glass is a material with a brilliant future . . . In the years to come, keep your eye on glass! Corning Glass Works, Corning, N. Y.

CORNING
means
Research in Glass

Arc Welding In Aviation

(Continued from page 22)

knows. Even the less cautious observers dare not prophesy.

Meanwhile research into the aplications of arc welding to aircraft continues. Development is expanding on scores of industrial fronts as arc welding progresses to new levels of aviation utility.

Alumni News

(Continued from page 14)

THE Bausch & Lomb Optical Company of Rochester, N. Y., of which Edward Bausch '75 is chairman of the board and where many Cornellians are employed, added the fourth star for continued excellence to its Army-Navy "E" burgee, on September 14.

The Kidder Press Company, Inc., of Dover, N. H., received a renewal of its Army-Navy "E" award on October 8. J. F. Sheppard, ME '07, is vice president and general manager.

The Alexander Smith & Sons Carpet Company of Yonkers, N. Y., received the Army-Navy "E" on November 23 for "high achievement" in the production of blankets, tarpaulins, bunk bottoms, stretcher covers, clothes bags, machine parts, aircraft engine covers, command car tops, canteen covers, tents, water bags, and gas masks.

Geer Speaks

SPEAKING before a group of engineering seniors at Cornell recently, Dr. William C. Geer '02, an Ithaca scientist, compared the properties of natural and synthetic rubber. He predicted that the 100,000-mile automobile tire will appear some time after the war as the result of synthetic rubber development. The former vice president of the B. F. Goodrich Company explained that, although natural rubber is superior in temperature resistance and in ability to rebound, synthetic products are more resistant to oil and sunlight and may be made more resistant to abrasion.

The Ithaca research scientist, who developed "de-icers" for planes and the special cut-resisting cover for golf balls, said that he did not expect motorists to get freedom of purchase for tires before 1946, unless Japan is beaten beforehand or the wild rubber program develops beyond expectations. He pointed out that the Japs control 15/16 of the world's crude rubber supply.

The engineers were urged to watch Butadiene, which produces Buna S rubber, when combined with Styrene. "A thousand synthetic rubbers can be produced from Butadiene, which is developed from petroleum as a base," the speaker said. He discussed two other synthetic products: Butyl, also derived from a petroleum base, and Neoprene, a Du Pont product. He described Butadiene as the parent chemical substance of ninety-nine percent of natural and synthetic rubber tonnage.

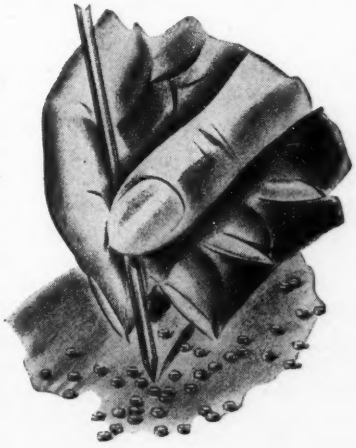
Whether the synthetic product will compete with the natural after the war, Dr. Geer said he did not know. At present, Buna S can sell for a fair price of twenty cents a pound, and the natural crude for twelve cents.

While a student at Cornell, Dr. Geer was very active on campus, having been president of the S. L. Woodford Debate Club and vice president of the Christian Association. He was also a member of several interclass debate teams and was a Memorial Orator. After

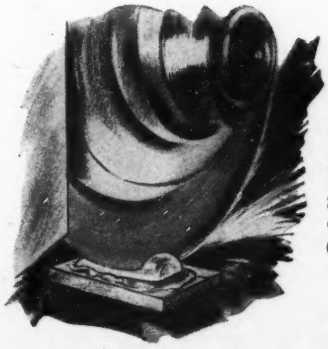
(Continued on page 26)

The synthetic sapphire that becomes a precious jewel...

1. High over Berlin on the instrument board of a bomber, these synthetic sapphires become the most precious jewels in the world. They're man-made jewels for instrument bearings. Without them, no bomber could drop its load with accuracy, no warship could navigate. Before Pearl Harbor most of these synthetic jewels came from abroad. But today industry is mass producing its own with the help of diamond blades and polishing compounds such as made by Carborundum.



2. Man-made sapphires are created by fusing aluminum oxide. To turn the rough boule into a bearing requires more than 100 precision operations, including cutting, grinding and polishing. No tolerance over 0.0003 in. is permissible. One of the best abrasives for producing a sapphire bearing is the diamond. So diamond grinding compounds by Carborundum are widely utilized.



3. War has given enormous impetus to the art of grinding. In industry, you may find operations which might be done better with abrasives. Carborundum engineers will be glad to consult with you on any such problem. The Carborundum Company, Niagara Falls, New York.

CARBORUNDUM
Reg. U.S. Pat. Off.
ABRASIVE PRODUCTS

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Geer Speaker

(Continued from page 24)

graduation, Geer continued work at Cornell and received his Ph.D. in chemistry and physics. He subsequently taught Chemical Engineering and was later associated with the B. F. Goodrich Company.

Captain Falconer

It has recently been announced by the 8th Bomber Station in London that Captain Robert T. Falconer, C.E. '30, has recently been promoted from a 1st lieutenant. He is the commander of a company whose personnel handle vital communications work for a Flying Fortress station. The recently promoted officer was an engineer at the Buffalo plant of the New York Telephone Company before his entrance into the army.

Walter Cisler

Walker L. Cisler, M.E. '22, formerly the assistant chief engineer of the Public Service Gas and Electric Company of Newark, New Jersey, has resigned to join the Detroit, Michigan, Edison Company. After graduating from Cornell, Mr. Cisler entered the employ of the former company as a cadet engineer and worked his way up to the post of assistant chief engineer. In 1941 he was appointed to the staff of the power coordinator of the Office of Production Management in Washington, D. C., and later served as chief of equipment production in the power section of the Office of War Utilities.

New Jersey Group

A luncheon meeting of the New Jersey Regional Group of the Cornell Society of Engineers was held in the Newark, N. J., Downtown Club on Friday, October 22, 1943.

Louis Winkleman, M.E. '23, chairman of the membership committee, reported 168 paid members, the largest in the history of the group. The attendance was also the largest at any meeting of the group to date.

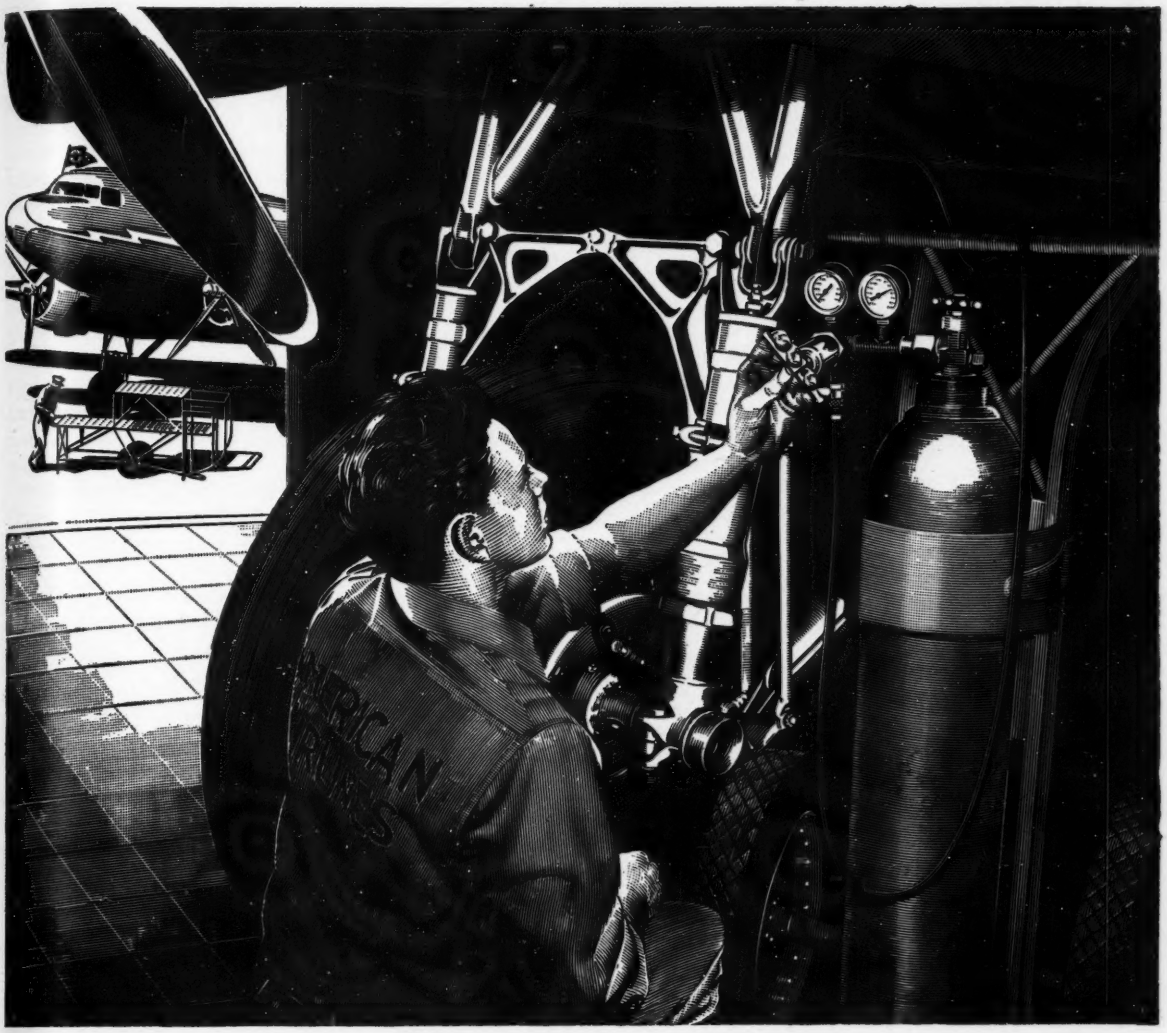
The club members agreed enthusiastically to support President James Lynah's equipment program.

Frank W. Pierce, M.E. '16, director in charge of industrial relations of the Standard Oil Company of New Jersey, was the principal speaker. Mr. Pierce's talk was on the subject of the post war relationship of labor and management. After his formal talk, he spent an hour answering questions from the floor, so great was the interest in his speech. The officers of the N. J. Regional Group this year are: A. M. Erskine, B. Chem. '14, Chairman; C. Reynall, M.E. '07, Vice Chairman; and S. J. McKelvy, C.E. '27, Secretary-Treasurer.

Charles Gennet, Jr.

Charles W. Gennet Jr. M.E. '98, vice-president of Sperry Rail Service, died of a heart attack at his home in Chicago.

After graduating from Cornell, Mr. Gennet had positions with the Baldwin Locomotive Works, the Southern Railway Company, and the Robert W. Hunt Company. He has been an official of the Sperry Rail Service for the last fifteen years. In 1941 he was awarded the Octave Chanute medal for the best paper presented before the Western Society of Engineers. Mr. Gennet came to Cornell from Binghamton, N. Y. While here he was a member of Chi Psi fraternity.



CUSHIONING *Flagships* FOR EASY LANDINGS

GLIDING in to an easy landing as a climax to a safe, comfortable flight is the result of attention to many details. That "cushioned landing," for example, is prepared before the flight by a serviceman as pictured above. He is giving the oleo struts their exact amount of "air cushion" — and an Airco gas regulator does the job accurately. The same method is used for controlling the air pressure to balance the hydraulic system which operates landing flap brakes and retractable landing gear—and Airco nitrogen is the gas widely used for this purpose.

Numerous are the aviation uses of Air Reduction gases and apparatus. For instance, an Airco regulator contributes to comfortable flight at high altitudes . . . arc welded jigs make possible mass production of airplanes . . . gas welding and cutting torches, as well as gas cutting machines play vital roles in the production of struts, engine mounts, and many other important aircraft parts.

With these products and through its role as a leading producer of atmospheric and chemically derived gases, Air Reduction is helping to facilitate essential operations in almost every major industry — from shipbuilding to food packing. If you would like to receive our informative publication "Airco in the News," we shall be glad to send a free copy. Write to Mr. G. Van Alstyne, Dept. C. P., Air Reduction, 60 East 42d Street, New York 17.

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George Bishop

(Continued from page 17)

List every term of his residence at Cornell. The next year saw George on the wrestling squad, on the varsity lacrosse team, and a cheerleader. Because of all these extra-curricular activities as well as a high scholastic record, he was given an Atmos award and the next year was elected to Atmos, honorary society in mechanical engineering.

In his Junior year, George was made rushing chairman and house manager of his fraternity, Kappa Sigma. He continued his work as a cheerleader and took second place in a University wrestling championship bout. His interests proved to be still more varied when he won a prize in the Fuertes Speech contest for his talk on "Welded Construction for Hydraulic Turbines." He used this same topic to win $100 in the Lincoln Arc Welding contest. George put the money in the bank, but he said it didn't stay there for very long. Tau Beta Pi recognized his abilities and elected him to their society, of which he was made vice-president this summer.

Last July George entered the Navy as a V-12, his reason being mainly that he considers the Navy to be a "very efficient organization." Behind it, too, lies his interest in boats. For a number of years George has been building boats, mostly to order. He designs them himself, even covering the task of balancing. One sailboat he built and used for four years and then he sold for $5. He also made a 13 foot utility fishing boat for 4½ people, the "½" being the buyer's small daughter. His sailing lessons were all learned from experience. On his second time out he tipped over the boat and to honor the occasion his picture was published in the local newspaper.

George has spent most of his summers vacationing at Ocean City, Maryland. During the summer of '42 he worked as a handyman in a Baltimore shipyard, and last summer he enjoyed the riotous company of 12 Navy roommates at Cornell. Toward the end of the term he went traveling as a cheerleader for the out-of-town football games with Dartmouth, Pennsylvania, and Navy.

If there had been no war, George would have turned to free-lance inventing after graduating this February. He has several ideas for practical mechanical gadgets and new features for carburetors. But March should see him in midshipmen's school on the way to an ensignship.

The secret of George's success seems to lie in keeping up his work all during a term; as a result, he has exempted most of his finals. His one pet peeve during college was the A.E. course. He will never forget the 35 he received at the end of the first five weeks of Business Law. But that is the exception which proves the rule.

Robert Benscoter

(Continued from page 11)

Kane High School of Kane, Pennsylvania. There he held a few class offices, was active in student council work, and played football and basketball. The Kane basketball team of that year was a well coordinated outfit, but it was not as successful as the football squad. Benny was an end on that Kane grid team which won the Allegheny Mountain Conference championship in 1939. Being an end, the incidents he most remembers are those passes which he should have got, but which he dropped. Yet his fingers were sticky enough to hold on to thirty points worth of passes in the end zone.

After working for some time as a grease-monkey in a garage, Robert Benscoter accepted a John McMullen Regional Scholarship to Cornell. Freshman year he was elected president of his C.E. class, and the following year he was re-elected for a second term.

Besides his other activities, at the present time Benny is a member of the Cornell wrestling squad. He also loves to skate and enjoys skiing when he gets home. Two of Benny's indoor hobbies are photography and music. He specializes in portraits and does his own developing, printing, and enlarging. When he gets to a piano, Benny plays both boogie-woogie and classical; and he likes both equally well.

In joining the Navy, Benscoter chose a branch of the service in which one of his brothers was already successful. That brother is a lieutenant in the Navy Air Corps and flies PBY's from a base in England. Another brother is a lieutenant in the Army Air Corps, but he has been a German prisoner ever since his B26 bomber came down in enemy territory during the Tunisian campaign. But Benny does not aim to be a flyer. Upon graduation he wants to join the "CB's", where he can get some experience in civil engineering.

Benny has taken a general civil engineering course; so after the war he wants to return to college for a year of specialized graduate work on highways, dams, and bridges. Then he plans to gain additional civil engineering experience by working for several years in the physical reconstruction of a war-torn Europe.

Tau Beta Pi Essays

(Continued from page 15)

without coordinated education of both the masses of the general public and the minority groups.

In this direction, education of school children and young people—the men and women of tomorrow—through the medium of the Scouts, and various young people's church groups, would be invaluable. Many of the parents of today are more fixed in their way of thinking, and it would be very difficult to persaude them to accept new viewpoints on a subject about which they are strongly prejudiced.

Education of the public is not the only step which might be taken. Many of the bases for racial prejudices would be eliminated if the underprivileged members of these groups were allowed to enjoy the educational opportunities offered the majority of the white people. True, there are definite educational facilities provided for these people, but their extent is pathetically out of proportion.

A nation may be well justified in demanding training and proven ability before entrusting any man with responsibility, but, at the same time, it is equally obliged to make available to each and every member of its society, regardless of race, or religion, the chance to learn to fulfill the job for which he is best suited, and so to contribute to the best of his natural ability toward the advancement of society as a whole.

Telephone Cable

(Continued from page 6)

connections from the conductors to the terminal are made, the whole is given a tough vulcanized cover. As shown in the illustration (Figure 2), there is a raised ring of rubber on the face of each terminal so that when they are forced together and locked, these rubber rings form a water-tight seal which will maintain its integrity indefinitely, even though immersed in water. The terminal is tied with a heavy metal sleeve having lugs which clamp with other terminals by means of a bayonet lock.

In actual use the one-quarter mile lengths are unreeled quickly from spools. They may be strung on poles, laid on the ground, or buried in a trench. The different lengths are connected by a simple twist of the coupling. Special short lengths are furnished to connect up to the terminal equipment or to bridge short gaps.

One of the recent problems in the manufacture of this cable has been the necessity for changing from rubber compounds to synthetics. For the insulation of the conductors, the development of a proper substitute

(Continued on page 31)

—Courtesy Mettee

Figure 3. A steel braid is shown being applied to the quad, which has been wrapped with foil-backed paper.

Preservation of Food

(Continued from page 9)

compartment which is essentially the design of the present home freezers. Today, there are essentially three types in use: well, cabinet, and walk-in. The well-type is the commonest of these three. It is a rectangular insulated box standing about three feet high and provided with one freezing well and several storage wells which open at the top. Evaporating plates are ordinarily arranged vertically throughout the box. Though this design makes economical use of the space, it is difficult to get at food stored at the bottom of the storage compartments.

The cabinet-type is designed like an ordinary refrigerator except that the shelves are refrigerated plates. In this type freezing and storage are not separated. An advantage over the well-type is that more plate surface is available for contact freezing. However, the cabinet-type does not make as economical use of the available space and the heat input is greater upon opening the door. Most people consider it a little more convenient than the well-type.

A walk-in unit is essentially a large cabinet kept at about 0°F. and provided with separate freezing space. These are found on some well-to-do farms. Other features are noteworthy. Many are equipped with a fan to provide air-blast freezing and all doors are double-sealed.

—Courtesy General Motors

A walk-in type farm home freezer.

The future of the home freezing unit will depend to a large extent on improvement in design for convenience. The present designs are such that a good deal of package handling is entailed when something is taken out of the unit. Except for this factor of convenience, a survey has shown that the present home freezers are found satisfactory by their users. In the future, the freezing unit may be combined with a refrigeration unit with a resultant decrease in the cost of each.

There has been some question as to whether the competition between locker plants and home freezers will result in the obliteration of one of them. Upon examining the relative merits and demerits of each, a locker plant is found to have these advantages: (1) the food can be purchased and processed without any effort on the part of the housewife, thus saving a great deal of time; (2) the food will be under the careful control of trained operators and under strict legal restrictions; (3) the service is inexpensive; (4) it is possible to employ freezing methods not practicable in home units. Locker

plants have these inherent disadvantages: (1) they are not as accessible as home units, thus requiring advance planning of meals; (2) they could not be used after business hours. The great advantage of a home unit is that it is readily accessible at all times. Its disadvantages are: (1) high initial cost; (2) places burden of food preparation on housewife; (3) more readily subject to breakdown.

Perhaps the answer is to use a locker plant for the processing and storage of the bulk of the food, and to have a small unit at home for the storage of the frozen food which will be needed in the immediate future and to provide for emergency feeding. Then, too, at the end of the war the prices of food freezers may be made so attractive that it will be worth the effort necessary to freeze food at home. Whatever the answer may be, there is no doubt that frozen foods will constitute an important part of our peacetime economy.

Telephone Cable

(Continued from page 29)

was not easy, but an insulating compound of low conductivity is now being produced. In the case of the jacket, Neoprene has been substituted for rubber. In some respects it is a better jacketing material than rubber in that it is more oil resistant and does not deteriorate so quickly in heat and sunlight. Hence the new Spiral-4 cable will be both insulated with and protected by synthetics.

College News

(Continued from page 12)

Associate Professor Charles I. Sayles has recently been appointed a member of the staff in electrical engineering in connection with the Navy Diesel engineering program. Norval L. Platt was also appointed as an instructor in this program in electrical engineering, and Abbot A. Putnam was appointed as an instructor in mechanical engineering. Wilma L. Crenolds was named librarian in the school of civil engineering.

Gross Speaks

Dr. Eric T. B. Gross, Assistant Professor in the School of Electrical Engineering, spoke at the December 16 meeting of the Syracuse section of the AIEE. His topic was "Some Engineering Features in European Power Systems Operation," a field in which Dr. Gross has had wide experience, having been head of the Central Station Department's Engineering Division of the AEG Union Electric and Manufacturing Company of Vienna, Austria, before coming to this country.

"Seabees"

The American Society of Civil Engineers has received a call for civil engineers to serve in the Navy "Seabees", it was announced in a recent letter from the National Chapter to the Cornell Chapter of the society. The letter stated that the Navy wanted men to serve as commissioned officers in the hard-hitting construction battalions which are playing such a vital part in the present conflict.

STRESS and STRAIN...

"The jungle was all around us. Ammunition, food, and whiskey had run out, and we were parched with thirst!"

"But wasn't there any water?"

"Sure, but it was no time to think of cleanliness."

* * *

Caller: "Is your Mother engaged?"

Little Boy: "I think she's married."

* * *

"I can't marry him, mother! He's an atheist and doesn't believe there is a hell."

"Marry him, my dear, and between us we'll convince him that he's wrong."

* * *

No one knows what a short skirt will be up to next.

* * *

The tired businessman arrived home. The cook had left that morning without giving notice. The market had been depressed all day, and now he found a farewell note from his wife. He knew that a shot would end it all . . . so he opened a bottle and took a big one.

* * *

"Hello! Dat you, Beatrice?"

"Yassuh."

"You gwine to marry me?"

"Sho' is, honey! Who dis on de phone?"

* * *

Captain (to A.S.T.P.): The man who sneaked out of the barracks last night to meet that girl on the campus step forward . . . Company, Halt!

* * *

And then there's the cannibal's daughter who liked the boys best when they were stewed.

* * *

Brady: "Too bad about your falling off the ladder, Mike."

Grady: "Well, it could have been worse. I had to be coming down for some nails, anyway."

* * *

Girl Friend (pouring an Engineer a drink): "Say when."

Engineer: "Any time after the first drink is O.K. by me."

"Sweetheart, if I'd known that the tunnel was so long, I'd have given you a kiss."

"Gracious! Wasn't that you?"

* * *

"Well, how was the burlesque dance?"

"Abdominal."

* * *

"Do you owe any back house rent?"

"We ain't got no back house, we got modern plumbing."

* * *

Farmer: "It's a funny thing—we found out that our white horses eat more than the black ones."

City visitor: "That's strange. How do you account for it?"

Farmer: "I guess maybe it's because we have more of them."

* * *

"Of course I'm not married," she said. "I'm nobody's fool."

"Then," said he, hopefully, "will you be mine?"

* * *

Definition

Wisdom—Knowing what to do next.

Skill—Knowing how to do it.

Virtue—Not doing it.

* * *

Two men and a young lady were on a Pullman for California and decided they had better get acquainted.

One man said: "My name is Paul, but I'm not an apostle."

The other said: "My name is Peter, but I'm not a saint."

The girl: "My name is Mary, and I don't know what to say."

* * *

There's nothing new about the night life of coeds. In the older days girls worked knights, too.

* * *

A group of local college boys were coming home from a party one night plastered to the gills. They stood in front of the house of one of their number and called for the father. "Will you please do us a favor?" said one.

"What do you want?" replied the father.

"Will you please come out here and pick out Johnnie so the rest of us can go home?"

Engineer: "Is this dance formal or do I wear my own clothes?"

* * *

Junior carried the following excuse to the teacher the morning following his absence: "Please excuse Junior for being absent from school yesterday. He has a new baby brother. It was not his fault.

* * *

Customer: I want a man's comb.

Salesman: Do you want a narrow man's comb?

Customer: No, I want a comb for a stout man with rubber teeth.

* * *

Engineer: Do insects ever get in your corn?

Ag Student: Sure but we fish 'em out and drink it anyhow.

* * *

Mrs. Murphy was the mother of four children. Mrs. Kelly, though many years married, was still childless. Mrs. Kelly became pregnant, and in due time gave birth to triplets.

On meeting Mrs. Murphy after the birth of the triplets, Mrs. Kelly gloated, "Did you know that this happens only once in 380,401 times?"

"I don't see how you had time to do your housework," was the response.

—Hexagon

* * *

Advertisement in *Enid* (Okla.) *News*:

Auctioneering is my special line of business. Prices are very reasonable. If I am out of town, make dates with my wife.

* * *

A fellow we know has a broken arm he received fighting for a woman's honor. It seems she wanted to keep it.

* * *

She was just an optician's daughter—two glasses and she made a spectacle of herself.

* * *

While giving a performance the magician spread a blanket over the newspaper and then proceeded to read it through the heavy cloth. All the coeds got up and left.